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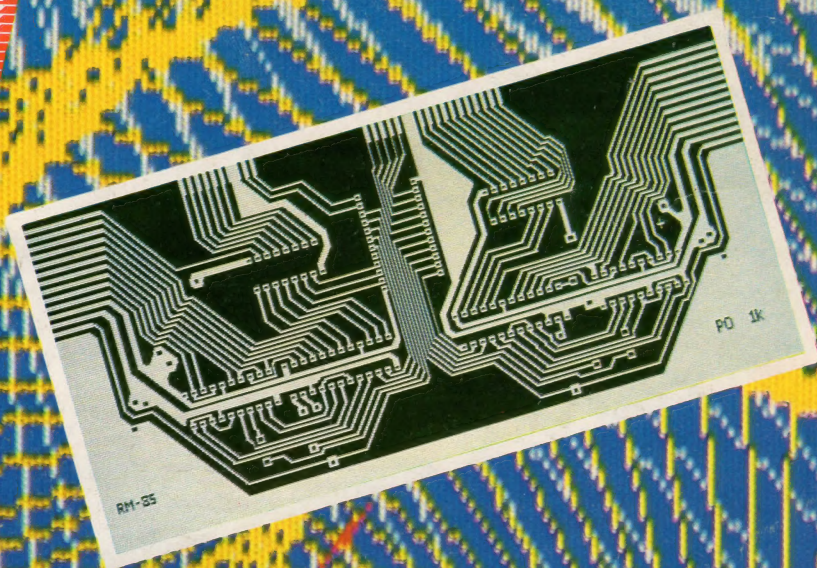
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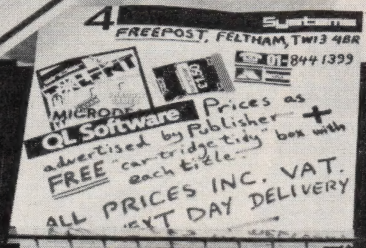
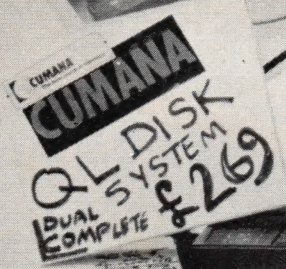


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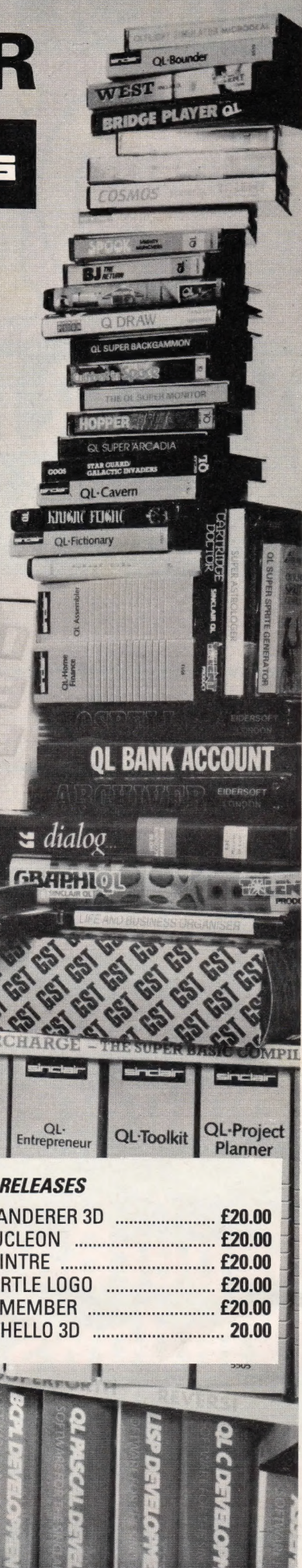


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ISSN 0268067X

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Telephone 01-222 9090

Published by Focus Investments, London

Distributed by Quadrant Publishing Services, Sutton.

Subscription information from: Quadrant  
 Subscription Services, Oakfield House, Perrymount  
 Road, Haywards Heath, West Sussex O444 459188  
 (£15 UK, £30 Europe, £45 Rest of the world).

Typesetting and Make-up by  
 Time Graphics (Northampton) Ltd.

Printing by Cradley Print, England.

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## NEXT MONTH

### Spectrum Connections

Spectrum Basic to SuperBasic. We show the way.

### Inside the Microdrive

The theory and practice behind Microdrive operation. And what to do when things go wrong.

### Test Drive

A comprehensive review of new disc systems for the QL.

### PLUS

Our regular features, reviews and program listings



# ALL SYSTEMS GO TO THE NINETEENTH MICROFAIR



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Explore those just launched interfaces, programs, hardware, magazines and books. Have a wonderful day out, see everything for Sinclair computers under one roof, just about all you ever wanted for your computer.

Full support for 48K Spectrums and a Big QL Section. Users Clubs and experts will be on hand to answer your technical queries plus bring and buy stand for special bargains. Watch out for fantastic show prices with Big Big savings.

For the show that's out of this world come to the Spring Microfair.

Send now for the reduced-price advance tickets on the coupon below.

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Cumana plus 256K Expandaram	£325	£405
Cumana plus 512K Expandaram	£355	£435
Box of ten 3.5" DSDD Disks		£39.00

## TWO MICRODRIVE TOOLKITS

Read and write microdrive sectors from basic and assembly language programs.

QL MDV EXTENSIONS TOOLKIT ..... £9.99

Adds six functions to Basic allowing read/write/verify of microdrive sectors, reading of medium names and "fingerprint" from sector headers, and includes a repeat format routine. An eight page manual explains the functions, details the microdrive format and uses example programs supplied on microdrive.

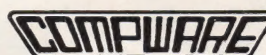
QL MDV ASSEMBLY LANGUAGE TOOLKIT (Source Code) £29.99

Over 1000 lines of fully commented assembly language source code to a set of routines equivalent to the above, but with some additions. An eight page manual explains microdrive format and how to implement a copy protection scheme as well as QDOS-like routine definitions.

BOTH THE ABOVE TOOLKITS ON ONE MICRODRIVE ..... £34.99

COMPWARE Also sell a wide range of QL peripherals (monitors/printers/modems/EPROM programmers) and software. Please send SAE for full price list.

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# QL SCENE

## Roll Call

The May 11 deadline for registration under the 1984 Data Protection Act is fast approaching. Under the Act, certain individuals and organisations who hold personal data on computer files must provide information for the Data Protection Register.

There are a number of exemptions. For example if you keep details of your family finances on computer files it will not be necessary to register. On the other hand, if you use your QL to keep records of the local cricket club or residents' association you will only be exempt if none of the members object to you keeping files on them.

Because of the myriad uses to which home computers are put it is likely there are thousands of people unsure of whether they need to register. This, no doubt, is the reason why four books on the subject are supplied with the registration form. In typical official style three of them explain the Act itself and the biggest tells you how to fill in the form.

Anyone who thinks they may be required to register should pick up a registration pack from the Post Office, or contact The Office of The Data Protection Registrar on 0625 535711.

## Q+ Disk Systems

Eidersoft and PCML have announced a new range of disk systems based on PCML/NEC hardware and Eidersoft software. The systems are aimed at the professional QL user.

A distinctive feature of the package is the inclusion of the new Eidersoft QL Mouse with co-ordinated software and the new NEC CMOS third height 3.5in. disk drives, which, it is claimed, run quieter, cooler and more reliably than many 3.5in. drives. The disk systems are QL style and colour co-ordinated in black.

There are two systems available, which are fully upgradable. The Q+ Disk System consists of a standard PCML disk interface with built in toolkit commands, twin 3.5in. third height NEC disk drives, QL Mouse and the Eidersoft software package, which consists of ICE, ARTice, a disk database, a jotter notepad, various conversion programs and a printer

## QDOS for Supermicro

Those of you waiting for Sir Clive to make his next Quantum Leap might benefit from taking a look sideways at what is happening elsewhere in the industry. Micro Concepts have just announced a new 6800 based machine which, according to them is going to be a close rival to the Commodore Amiga.

The most interesting feature of the Micro Box III is that one of its five operating systems — SMS2 — was written by QDOS author Tony Tebby. Indications are that it will run much of the software available for the QL.

The machine is based around the Motorola 68010 microprocessor and the basic unit features a ½ Megabyte RAM. Initially the Micro Box III will sell as a board system, but the company has plans to market it as a complete workstation. This will comprise processor box, colour monitor, 20Mb Winchester disc, twin 800K 3½in. floppies, keyboard and mouse. It will sell for around £2,000. As well as SMS2 the machine will run Tripos, GemDOS, OS9 68K and CPM 68K.

Forget about WIMPS, Micro Box III has VROOMS — Virtual Raster Object Orientated Multidisplay System.

Instead of using windows to display multi-tasked jobs, each program is allocated a full screen. These can be flicked through to check on the progress of individual jobs.



## All in one Expansion

Nottingham-based Micro Control Systems has released a RAM expansion, disc and printer interface for the QL. The MCS expansion cartridge provides either 256K or 512K of additional memory, Centronics parallel printer port and disc interface.

The hardware is accompanied, for

Graphics are provided by a Motorola RMS chip which gives a screen resolution of 640 x 500 pixels. It has a stereo sound generator with 6 oscillators and two envelope generators.

There are plans to supply two upgrades, an 8Mb RAM expansion and the revolutionary INMOS transputer. Both of these should be available by the end of the year, by which time the cost of the chips should have dropped sufficiently to make it a viable option.

a special introductory period, by a utilities ROM. In addition to RAM disc software it provides 'non destructive windows', which facilitate the use of pop-up menus from software. There is also a multi-tasking facility which enables the use of all four Psion packages concurrently, and a format utility.

The cost of the unit is £199 for the 256K version and £299 for the 512K.

spooler on disk. The Q+ Executive System is identical but has a 256K RAM disk interface and the CHOice multitasking software. A module is available to expand the Executive

System to the full 640K RAM. Both systems come complete with a bound manual covering disk, mouse and software operation.

The Q+ Disk System costs £399

inc vat, the Q+ Executive System is £499 inc vat, and the Executive expansion module is £95 inc vat. The systems are available exclusively from Eidersoft mail order on 0708 851099.





UPGRADES: Send your original cartridge — not the packaging — plus £5 (£6 if overseas, £10 if Supercharge) for an upgrade to the latest version of any D.P. program.

## Super Astrologer de luxe

You don't have to be C-C-C-Claudius to know the value of a good astrologer — and QL Super Astrologer is the definitive character reading and personality delineation package. You need absolutely no knowledge of Astrology to use this system — but it is not a toy as several professional astrologers have been stunned to discover.

This excellent package can cater for any birth-date or time, and any place on earth. Automatic personality comparisons can be performed — ideal for compatibility testing. Sample personality files are provided for lots of famous people, including Prince Charles, Princess Diana, Edison, Hitler, Roosevelt, Queen Victoria, and Freud... Super Astrologer pushes the QL to its limit. It uses both microdrives and over 120K of data. The 58K machine-code program loads in under ten seconds and performs all calculations quickly and precisely. It gives an amazingly detailed personality readout, spread over 4 single-spaced A4 pages, or on the screen. Working astrologers can customise the text with the editor.

Super Astrologer was designed by a professional astronomer, working with an astrologer and a huge library of books on modern astrological technique. It handles the Natal chart, aspects, progressions, transits etc. Super Astrologer is very accurate and a powerful tool for astronomers as well as astrologers. It does all the Ephemeris calculations at colossal speed, with hosts of useful features including a scale display of planetary positions with variable magnification, interplanetary distance calculator, etc., etc.

"Highly ambitious... the dust hasn't had time to settle on my printer since my friends got wind of this program... it is accurate, comprehensive and easy to use... you certainly will not find as good an astrology program as this on any other home computer". QL WORLD.

We predicted that Super Astrologer would be a massive hit on the QL — and we were right! The new DE LUXE version allows full AND/OR selection in the delineation files, and print-outs of the Natal Chart and Solar System display, with full graphics. Super Astrologer de luxe costs £24.95, with full instructions.

## Super Sprite Generator

Super Sprite Generator is a powerful graphic animation package. After over a year of enhancement and revision, Super Sprite Generator version 3.5 must be the Ultimate QL animation system. Super Sprite Generator allows you to create all the high speed, high tension, high drama special effects of arcade and adventure games.

A 'sprite' is an animated graphic symbol — a bird, a plane, Super-man or anything else you choose. Multicoloured sprites can be designed with the machine-code sprite editor, and compiled into groups of up to 16 'frames' for automatic animation.

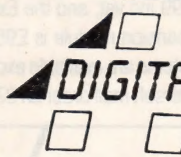
Up to 256 sprites can be held at any time, with 16 moving on screen simultaneously. Ultra-large sprites are allowed. At top speed the motion is faster than the eye can see!

As sprites move around they can be programmed to detect 'collisions' with one another, the border or the background, automatically. Sprites can pass over or under one another, with absolutely no 'flicker' at all. Speeds can be independently set, and sprites can be inverted or reversed at will.

Super Sprite Generator is exceptionally easy to use from Super-BASIC, fast SUPERCHARGED BASIC, or machine code. The new SuperBASIC commands are fully documented and error-trapped. You need no machine code knowledge at all — all the hard work is done for you. You don't even need to be able to draw — lots of demonstration sprites are provided!

"Takes all the hard work out of handling sprites.... results achieved are really excellent", QL USER.

Super Sprite Generator, version 3.5, costs just £24.95.

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## SUPER FORTH plus Reversi

Forth is a structured, intermediate-level programming language with a cult following. Forth is a remarkable language which combines the speed of machine-code with high-level control constructs and interactive testing facilities.

Gerry Jackson's SUPERFORTH is a complete, ultra-fast implementation of the Forth '83 standard. In addition to the standard commands SUPERFORTH includes a plethora of extra features to make the best of the QL:

- \* All the QL's features are supported, including sound windows, graphics, disk systems and other peripherals. Input and Output may be re-directed at will.
- \* Full 32 bit integer arithmetic, allowing lightning-quick calculations to nine digits of precision. All floating-point arithmetic is also supported, including Logarithmic and Trigonometric functions.
- \* Incredible speed — much faster than any other QL Forth. A Sieve of Eratosthenes (the Byte benchmark) runs in just 4 seconds in SUPERFORTH, compared with 3 minutes 30 seconds in QL SuperBASIC (or 3 minutes 10 seconds in IBM PC BASIC!).
- \* Multi-tasking (demo supplied) with full job control for SUPERFORTH and machine-code programs. SUPERFORTH itself runs as a task, so other programs may run at the same time.
- \* Built-in screen-editor for Forth blocks or named files — alternatively you may use Quill to edit Forth source.

The SUPERFORTH package also includes an extremely powerful implementation of the classic boardgame REVERSI. This superb program demonstrates the speed, flexibility and expressive power of SUPERFORTH. REVERSI is written entirely in SUPERFORTH, and the well-written source-code is supplied for you to study or adapt.

REVERSI 1.4 offers nine levels of play, with near-instantaneous response on levels 1 and 2. Many options enable you to exchange sides, retract moves, set up positions, ask for hints or watch the computer 'think'. Moves can be entered by co-ordinate or simply by 'pointing' at the required position.

The latest version of REVERSI — version 1.4 — is better than ever! It is guaranteed to beat Sinclair Reversi every time, when the two are played on similar levels. It beat the Spectrum champion, MOI Othello, 10-0 in a supervised match — in fact we have yet time — or any human capable of beating it at its top skill level. This is hardly surprising when you consider that REVERSI 1.4 uses state-of-the-art Artificial Intelligence techniques: alpha-beta tree searching with pruning and a 'killer' heuristic.

"Congratulations on an excellent program", E. Azzo Pardi, Malta.  
"The best Forth program", H. Houss, Berlin.

Digital Precision SUPERFORTH & REVERSI cost £29.95  
REVERSI 1.4 is available separately, with full rules and an introduction to the strategies of the game, for £12.95.

## SUPER ARCADIA

Super Arcadia is a twin-pack of two superb machine-code arcade games.

BMX Burner is a subtle many-screen collect, detonate and dodge space arcade adventure, with sound-effects and multicolour animated sprites. The puzzles in this program have been carefully crafted to make an addictive and varied game which can be played time and time again.

Grid Racer is a grid-runner/painter game with great sound effects and scrolling windows. Grid Racer is a race against time, chasers and the dreaded Boot! One or two players; microdrive high score table.

BMX Burner and Grid Racer cost £15.95 together



# SUPERCHARGE

Supercharge is a program that translates slow, interpreted SuperBASIC into fast, flexible 68008 machine code — totally automatically. You need no specialised knowledge at all.

Supercharge supports the entire syntax of SuperBASIC. Compiled programs run incredibly fast; some run over 100 times faster than in the original SuperBASIC. Microdrive loading times are accelerated by a factor of up to 30. Multitasking is fully supported, and easy to use.

- ★ ALL Supercharged programs multi-task — you can run any number of them on one QL, simultaneously (RAM permitting)
- ★ Supercharge supports full floating point arithmetic, to an accuracy of NINE digits (SuperBASIC only displays seven decimal places). Arithmetic is breathtakingly fast — integer handling is often 100 times faster than in interpreted BASIC.
- ★ Supercharge allows the entire syntax of QL SuperBASIC: file-handling, multi-dimensional arrays, local variables, procedures and functions (with parameters), turtle graphics, windows, both display modes, all devices (including disk drives, modems etc.), sound, graphics, colour, strings, etc., etc.
- ★ Supercharged programs are reliable on all versions of the QL. Most bugs and restrictions imposed by the SuperBASIC interpreter are corrected or lifted by the compiler. Say goodbye to the integer FOR bug, string and integer SELECT bugs, the CALL bug, the 'too many parameters' bug, the GOSUB in a loop bug, the RESPR bug, etc., etc.
- ★ Supercharge includes a sophisticated optimiser, which the user can direct to produce either especially compact or fast 68008 machine-code, on a line by line basis.
- ★ Supercharge is compatible with virtually all QL add-ons, including disk systems, expansion RAM, and even add-on commands which do not form a standard part of SuperBASIC! 'Toolkit' utilities work beautifully, so long as they don't try to modify interpreter data-structures (which obviously aren't there). Very few commands do this, and Supercharge generates clear warnings where incompatibilities might exist.
- ★ Supercharge issues explicit, plain-English reports and warnings, showing the exact position of mistakes. Many 'trivial' errors are automatically corrected!
- ★ Supercharge is fast, device-independent, concise and easy to use — it even compiled itself!
- ★ Supercharged programs may be interactively tested 'in slow motion' using the compatible SuperBASIC interpreter.
- ★ Supercharged programs are protected against unauthorised modification, as they cannot be LISTed. Compiled code loads incredibly fast — for instance, a 75K SuperBASIC program loads 25 times faster once compiled.
- ★ The 105 page Supercharge manual is comprehensive and readable, with tutorial and reference sections, examples, hints and tips, and a full index and glossary.

## BASIC compiler

QL SUPERCHARGE is the most sophisticated BASIC compiler ever published. It is the result of 18 months work by a dedicated team of programmers led by Simon Goodwin, a top software designer and journalist.

The verdict from Supercharge users:

"Simple to use... an excellent product which coped completely with the vagaries of my own programming", E. Cogswell, Havant.

"Outstanding — the most important piece of QL software so far", Mike Walsh, Birmingham.

The verdict of Sinclair User (March 1986 issue) "A Sinclair User classic" ★ ★ ★ ★ ★

The verdict of QL world incorporating QL user, (March 1986 issue): The arrival of this product is a significant event for the QL, I have no hesitation in recommending Supercharge.

"The manual is very informative and easily read... supercharge is great! Better than I ever expected", R Schubel, New Jersey, USA.

"May I say how pleased I am with Supercharge", Richard Blake, London.

"I was impressed by the quality of the implementation and high degree of compatibility with SuperBASIC", T. Gruber, Aachen, W. Germany.

"Very high quality software... a very informative and useful manual", Michael Gottlieb, Edware.

"Very good and fast in use. You seem to deliver what you promise, unlike other QL suppliers", R. Coughlan, Liverpool.

"Supercharge is a great improvement on SuperBASIC and has given me new faith in the QL", T. Hansen, Norway.

"I was very surprised by the professional quality — it is really excellent", F. Moya, France.

"Invaluable... I think Supercharge is an excellent product, and the documentation puts Sinclair to shame", Dr K. Williams, Putney.

"The manual is very good. It inspires confidence and has a sense of humour. Supercharge itself is great", H. Gupta, Northampton.

The manual is a model of clarity, readability and accuracy: congratulations! The car on the box should be a Rolls Royce", M. Johnson, London.

"Much more helpful than any previous manual I have ever read", Dr W. Fuggle, Birmingham.

"Easy to use — very well written", J. Hayes, Leeds.

"Very easy to use — very impressive", Dr G. Taylor, Harrow.

"Very impressed — should come as standard with the QL", A. Pritchard, Surrey.

"A credit to British enterprise", Dr Helmut Aigner, Austria.

"Excellent!" — Colin Opie, McGraw Hill; W.D. Software, Jersey; A Dedman, Ipswich; Dr Archer, Wakefield; C. Grogan, Huddersfield; G. Chew, Clwyd; K. Paul, Gerrards Cross; A.B. Steen, Eastleigh, Ingenieurburo Neitzel, Detmold, W. Germany... and many others.

The latest version of Supercharge — version 1.17 — is available as an upgrade, price £10, to users who wish to get the very most from their compiled programs.

Supercharge costs **£59.95**; this includes the compiler, code-generator, utility programs, add-on commands for task control and error-trapping, demonstration software and over 100 A4 pages of documentation. £5 off SUPERFORTH, £5 off SUPERSPRITE and £2 off Super Monitor + Disassembler when these programs are ordered at the same time as SUPERCHARGE.

SUPER OFFER !! SUPERCHARGE + ICE £79.95  
\*\*\*\*\* SUPERCHARGE + ICE + CHOICE £89.95  
\*\*\*\*\*

All Digital Precision Software is available now. Software is compatible with ALL versions of the QL, memory expansion and disk interface systems.

Digital Precision software is available from TBD, Lightning, Creative Sparks, and other distributors of good software. Buyers in Central London can visit Micro-Anvika at 224 Tottenham Court Road.

Supercharge and Superforth are available on 5 1/4 inch 1440 sector disk at no extra charge.

DEALERS: our discounts are generous — phone us now on 01-527 5493.

PROGRAMMERS: We intend to dominate the QL software market, and we pay excellent royalties for good QL software. Send us a disk or cartridge now, for a prompt, confidential evaluation of work in progress.

## Super Backgammon 3.0

Super Backgammon is an excellent machine-code program and a worthy opponent for beginners and experts alike. It has excellent graphics and obeys all the rules of Backgammon (superentertaining game at all of its six skill levels).

Other features include dual clocks, three playing modes, computerised dice thrower (with optional override if you're suspicious or you want to cheat!), 'Hint' option, evaluation display.

Version 3.0 is very much stronger than its predecessors, and the display has been enhanced to work on all colour or monochrome displays. The upgrade, for existing users, costs £5 upon return of the original cartridge.

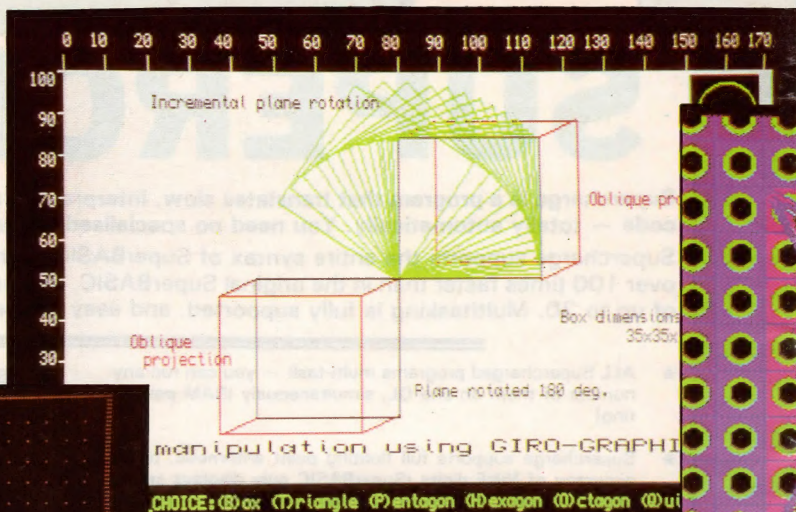
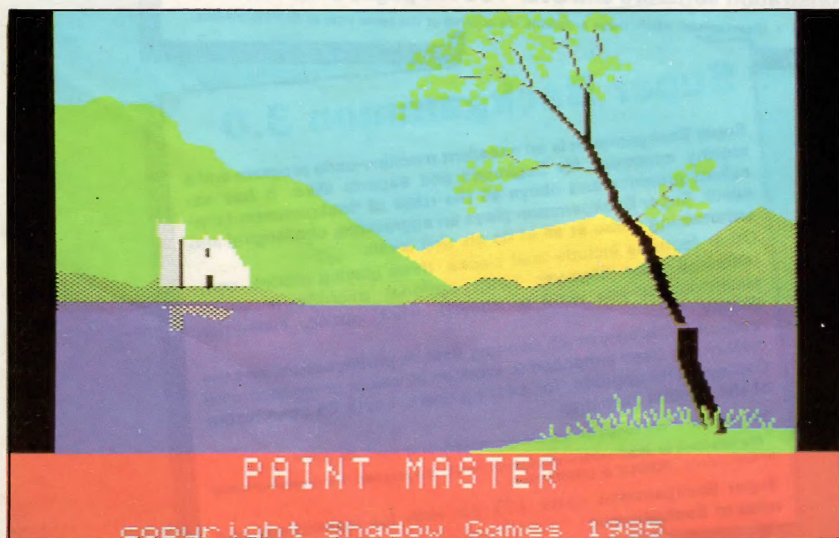
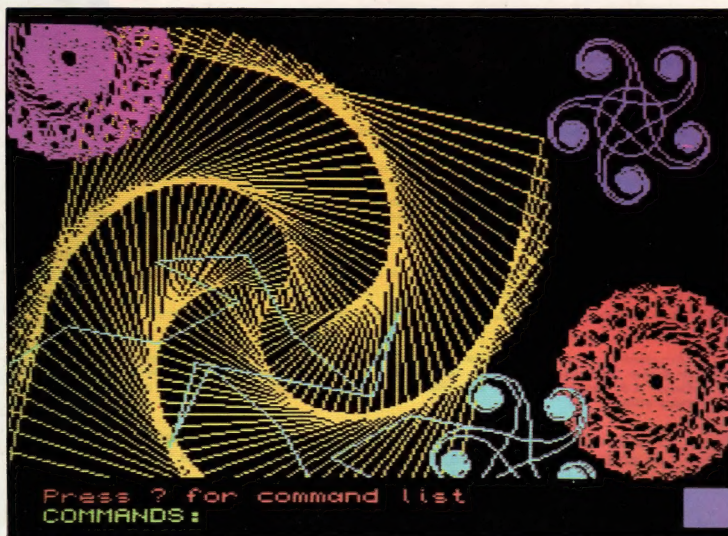
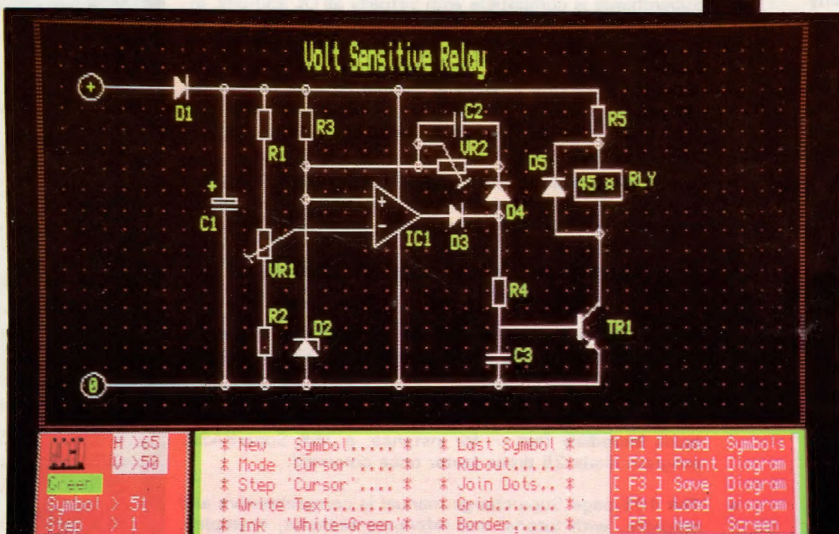
"Be warned — the computer will almost certainly beat you!" QL USER.  
"The attention to detail evident throughout results in a program that is very enjoyable to use", ELECTRONICS & COMPUTING

Super Backgammon costs **£12.95**, with full instructions and rules of Backgammon.

QL SUPER MONITOR & Disassembler is a multi-tasking program analysis tool. Test, edit or examine any machine code program with Super Monitor version 3.0 : £18.95



# QLAD



CAD software for the QL enables you to turn your hand to anything from technical drawing to artistic improvisation. Ron Massey puts electronic pen to paper and compares the results.

**W**hen one considers that the QL is not designed primarily as a graphics machine, each new package released to the market exhibits tantalising new aspects of the power of this superb micro. If present appearances are anything to go by, the excitement caused by new programs and peripherals for the QL is justifiable.

Computer-assisted design, originally the exclusive realm of mainframes available to only the largest of design offices, has become progressively more accessible to the smaller and no less needful technical illustrator.

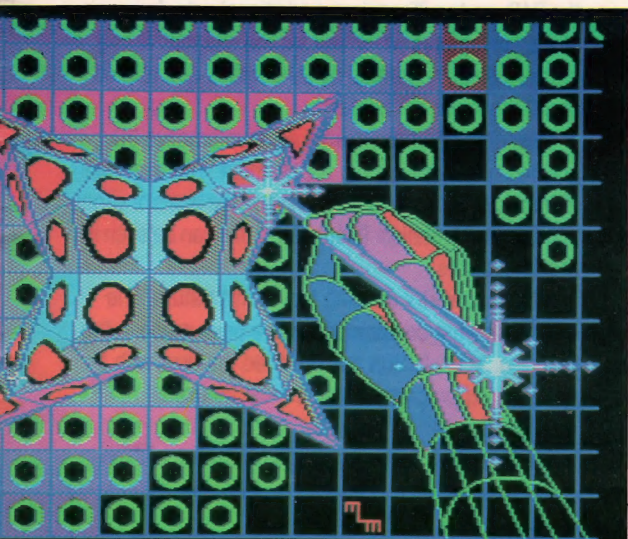
In common with many areas of endeavour, proficiency in a field usually can be equated with the years required to obtain a level of acceptable expertise. That is specially evident in the field of graphic arts, where an individual may be required to call on a wide range of knowledge to be able to produce a comprehensible graphical concept.

Often viewed as an aid to error-checking, the computer also provides a system of creating artwork relevant to the requirements of the user and a mechanical medium for production of precision copies of drawings. Those features, coupled to the ease with which a drawing, be it of a technical or an artist nature, can be altered to suit particular requirements can scarcely be equalled.

Large dedicated CAD systems are often limited to their design parameters; draughting as seen in the aircraft or automotive industry, for example, requires a range of operating systems, each with its own particular application, whether it be for electronic circuits, printed circuit boards, working drawings, exploring design concepts or analysing the complex inter-reaction of mechanically-related components.

Evolution of the micro progressively has provided a cost-effective means of enticing the smaller drawing office into CAD applications. That, in turn, has





produced a snowball effect in the entire industry whereby computer manufacturers, programmers and end-users are finding that the smaller and more powerful machines are capable of providing sophisticated services denied even to some of the bigger systems.

CAD has provided a means to designing commodities as widely diversified as optical systems, electronic products, aircraft, drugs and virtually any mechanical device imaginable. Integrated throughout the production processes, from concept to delivery, the computer often is directly involved in producing the more abstract concepts of promotion and other visual representations.

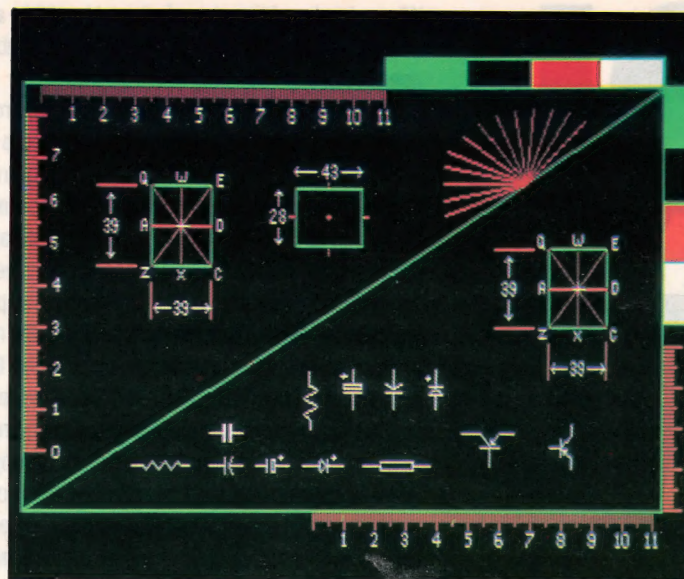
The QL is proving its versatility in the entire and exacting field of graphic arts. At present there are eight major drawing packages available which provide the graphical artist with a means of producing a wide range of professional-quality drawings, whether they be for initial design or for illustrations to be included in audio-visual presentations.

Each of the programs provides the user with powerful and exceptional drawing tools often characteristic of a specific package. It is for that reason that potential purchasers should take the time to study the features outlined at the end of this survey so as to acquire the package most suited to their requirements.

It must be stressed, however, that because of their specialised applications, drawing programs in general, and CAD programs in particular, should be studied carefully and, almost without exception, require time for the user to acquire any degree of fluency with them.

The first of the CAD-orientated packages in this survey is from Micr\_A\_Soft. *Design Board II*, at 43K, can only be described as a versatile modular drawing system in which the user can apply each of the methods of drawing, in turn, to a particular task.

Undoubtedly the initial thrust of a generation of programs which can manipulate three-dimensional views of an object, *Design Board II* is aimed at the artist orientated towards drawing to scale. The approach used throughout the program assumes a deliberately-placed "pen" at a required location on the "paper".



## DESIGN BOARD

Micr\_A\_Soft

<b>Drawing Method</b>	Continuous, co-ordinate and plot
<b>Modes</b>	4 only
<b>Colour range</b>	0 to 255 in mode 4
<b>Menu</b>	Yes
<b>Icons</b>	No
<b>Help pages on screen</b>	No
<b>Aids: Border reference</b>	Yes; pixel reference border top and left side
<b>Grid (on select)</b>	Yes; option of either or both of two
<b>Cursor co-ord indicator</b>	No
<b>Prompt Window</b>	Yes
<b>Image Pan/Scroll</b>	Yes
<b>Element Move/Reposition</b>	No; entire drawing may be repositioned using Pan/Scroll
<b>Image magnification</b>	No
<b>Auto mirror image</b>	Yes, individual elements in CAD mode
<b>Pen direction indicator</b>	Yes, angle indicator in main and CAD modes
<b>Drawing tools:</b>	
<b>Pen</b>	Yes; see special features
<b>Width control</b>	Yes; In paint mode only
<b>Brush - sizes</b>	3; 0 to 2
<b>Airbrush</b>	No
<b>Erase</b>	No; On over-draw only
<b>Auto fill - on select</b>	Yes
<b>Command access</b>	Command letters in prompt windows
<b>Method of entry</b>	Keyboard
<b>Cursor on screen</b>	In paint, text and banding modes
<b>Control</b>	By entering BAND mode and placing a point; By using the x and y co-ordinate locations; or By entering the pixel dimensions
<b>Movement</b>	1 or 5 pixel increments in paint and text modes
<b>Turtle graphics</b>	Yes; in main and paint modes
<b>Type</b>	Arrow in text mode; Block in paint mode
<b>Auto Colour Change</b>	No; requires over-drawing
<b>Auto Geometrics</b>	Yes; by dimensioning;
<b>Rubber banding</b>	No
<b>Circle</b>	Yes - by positioning the centre point
<b>Ellipse</b>	Yes - by positioning the centre point
<b>Arc</b>	Yes - by plot and dimensioning
<b>Box</b>	Yes - positioned at lower left corner
<b>Triangle</b>	Yes - positioned at lower left corner
<b>Others</b>	Yes - Octagon, Pentagon and Hexagon; plan or oblique projection
<b>Line: length</b>	Plot, paint or continuous draw
<b>width</b>	In paint mode
<b>Element movement</b>	No
<b>Element duplication</b>	Yes; CAD mode duplication
<b>Shadowing</b>	No
<b>Text</b>	Yes
<b>Colour</b>	Full range (0 to 255 in mode 4)
<b>Sizes</b>	4
<b>Positioning</b>	Prior to text entry
<b>File Control</b>	Yes
<b>Directory</b>	Yes; to a printer
<b>Load a screen</b>	Yes
<b>Save a screen</b>	Yes
<b>Delete a file</b>	Yes
<b>Format cartridge</b>	Yes
<b>Printer Dump</b>	Yes; special Eigen screen dump
<b>Area printed</b>	User-selected, using cursor wires
<b>Demo pics supplied</b>	No
<b>Ave. no. files/cart</b>	3; saved as a screen dump
<b>Principal application</b>	Technical scale drawing



# QL AD

Where freehand drawing of elements within a major component is required, four modes are available to the user.

More than adequate draughting aids are provided in the form of grids, border co-ordinates, and a drawing angle indicator. Direct position addressing, in the form of pixel co-ordinates, is included in the operating system in all but the Paint modes. Prompts at each stage in each of the modes are comprehensive, as are the position reminders when in the point-to-point — Banding — and CAD modes. Any of the 30 mode 4 colours and stipples is available by entering the composite code required for either ink or paper modes.

The Giro-Graphics and CAD modes require only height, width and depth dimensions of an object to be entered. Once completed, the position of the object — centre, in the case of a circle or ellipse; lower left corner, with angular objects — is entered, as

prompted.

Giro-graphics will then draw the dimensioned object in one of the standard shapes provided in the program; the CAD mode will require an additional entry from one of the cursor keys which will set the element at one of four positions, separated by 90 degrees and rotated round the lower left corner.

Describing Design Board II as an interactive 3D graphics package is a fair assessment. The user can manipulate elements of a drawing on the basis of either point or plane rotation. Examples of this can be seen in the illustrations.

With a powerful drawing tool of this nature, one might ask what compromises have been made in the program. Micr\_A\_Soft has provided the user with an open-ended program in that it must be used intelligently.

It is possible, with very complex drawings which

## QCAD

Strong Computers £39.95

Drawing Method	Continuous or plot
Modes	Mode 4 only
Colour range	White or green drawing; red grid
Menu	Yes
Icons	No
Help pages on screen	No
Aids: Border reference	No
Grid (on select)	Line or dot; not independent of drawing
Cursor co-ord indicator	Yes
Prompt Window	Yes
Image Pan/Scroll	No
Element Move/Reposition	Yes; from components held in the array
Image magnification	No
Auto mirror image	No
Pen direction indicator	No
Drawing tools:	
Pen	Yes
Width control	No
Brush — sizes	No
Airbrush	No
Erase	Yes
Auto fill — on select	Yes
Command access	Command letters in prompt windows
Method of entry	Keyboard
Cursor on screen	1
Control	Cursor keys; continuous or point plot
Movement	1 or 5 pixel increments
Turtle graphics	Yes
Type	'+' for drawing; '-' for plot; '*' for erase; '0' for 'Join Dots' (points) mode
Auto Colour Change	No
Auto Geometrics	Yes
Rubber banding	Yes
Circle	Yes
Ellipse	Yes
Arc	Yes
Box	Yes
Triangle	No
Others	No
Line: length	Plot or turtle graphics
width	Not applicable
Element movement	See special features
Element duplication	Yes; up to 20 symbols held in an array
Shadowing	No
Text	Yes
Colour	White or green
Sizes	3
Positioning	On screen, after input
File Control	Yes
Directory	No
Load a screen	Yes; screen or symbols
Save a screen	Yes; screen or symbols
Delete a file	No
Format a cartridge	No
Printer Dump	Yes; Miracle Systems
Area printed	Whole of drawing area; with or without borders
Demo pics supplied	1; See special features
Ave. no. files/cart	3
Principal application	Any technical drawing incorporating symbols. As supplied, for drawing electronic circuits

## PAINT MASTER

Shadow Games £24.95

Drawing Method	Position or plot
Modes	4 or 8 (switchable within program)
Colour range	0 to 255
Menu	Yes
Icons	No
Help pages on screen	No
Aids: Border reference	Yes
Grid (on select)	Yes; independent of drawing
Cursor co-ord indicator	Yes
Prompt Window	Yes
Image Pan/Scroll	No
Element Move/Reposition	Yes; in either of two modes
Image magnification	Yes
Auto mirror image	Yes, in any of four directions; relocate option
Pen direction indicator	No
Drawing tools:	
Pen	Yes
Width control	Yes; 4 stages
Brush — sizes	Yes, size is infinitely variable
Airbrush	Yes
Erase	Successively deletes previous entries
Auto fill — on select	Yes
Command access	Window
Method of entry	Key select
Cursor on screen	2, at all times
Control	Alternate by toggling; independent or linked
Movement	Continuous
Turtle graphics	Yes, in paint mode
Type	'+' on AH & JM.; '@' on JS
Auto Colour Change	Yes, in user-selected stages
Auto Geometrics	Yes
Rubber banding	Yes
Circle	Yes; locate centre position
Ellipse	Yes; rotatable axis; infinite eccentricity
Arc	Yes; 180° phase control
Box	Yes; determined by relative cursor positions
Triangle	Yes; 4 pre-defined; 1-with rubber banding
Others	No
Line: length	Yes
width	Yes
Element movement	No
Element duplication	Using step-and-repeat 'Position' option
Shadowing	No
Text	Yes
Colour	0 to 7; 0 to 4
Sizes	0, 0 to 3, 1
Positioning	Directly on screen before pressing <ENTER>
File Control	Yes
Directory	No
Load a screen	Yes
Save a screen	Yes
Delete a file	Yes
Format a cartridge	No
Printer Dump	No
Area printed	—
Demo pics supplied	2
Ave. no. files/cart	30 to 60
Principal application	Illustrating Adventure games, picture source program for inclusion in other programs and general graphics package



incorporate all of Design Board features — especially those involving Image Designer, producing inward or outward spirographics — to run out of memory on an unexpanded QL. It is also possible to run out of memory when drawing occurs in a haphazard fashion, such as completing part of a drawing and then erasing by entering a new paper colour command and starting again without re-starting the program.

Provision is made for recovering from that condition, enabling a drawing to be saved to Microdrive. The condition, however arising, can be prevented only by considered planning before drawing starts. Had Micr\_A\_Soft opted for incorporating limitations on the range of drawing features, much of its effectiveness would have been lost.

Of special interest to technical illustrators is the specially- commissioned Eigen screen dump. Printing the entire colour range as differential dot patterns

vertically in the printer, distortion is minimal and occurs in a slight compression of the vertical element of the picture. The dump, which includes selective screen areas to be printed, makes provision for printing two full screens on an A4 sheet of paper.

Available from Strong Computers, the second program, QCAD is a specialised package for artists who require drawings involving glyph notation. Probably the most specialised of the graphics packages in this survey, QCAD is supplied with a comprehensive library of 97 standard electronic symbols and includes capacitors, op amps, diodes, transformers and a range of IC pin-outs in a variety of package types. Some of them are duplicated because of a requirement for either orientation or component polarity.

Enhancing the versatility of the package, QCOMP, a separate routine, is included for producing libraries of

# QL AD

## ART MASTER

Micr\_A\_Soft £12.95

Drawing Method	Continuous, Co-ordinate or plot
Modes	Mode 8 only
Colour range	0 to 255
Menu	Yes
Icons	No
Help pages on screen	No
Aids: Border reference	No
Grid (on select)	2; must be laid on before drawing
Cursor co-ord indicator	No
Prompt Window	Yes
Image Pan/Scroll	Yes
Element Move/Reposition	No
Image magnification	No
Auto mirror image	No
Pen direction indicator	Yes
Drawing tools:	
Pen	Yes; points are entered by BANDING command
Width control	Yes; in paint mode
Brush - sizes	Yes; 3 sizes available
Airbrush	No
Erase	No; must be over-drawn with required colour
Auto fill - on select	Yes
Command access	Command letters
Method of entry	Keyboard
Cursor on screen	In paint mode only
Control	By entering BAND mode and placing a POINT
Movement	1 or 5 pixel increments in paint mode
Turtle graphics	Yes
Type	Block, in paint mode
Auto Colour Change	No; requires over-drawing
Auto Geometrics	Yes, by dimensioning
Rubber banding	No
Circle	Yes — by positioning the centre point
Ellipse	Yes — by positioning the centre point
Arc	Yes — by plot and dimensioning
Box	Yes — positioned at lower left corner
Triangle	Yes — positioned at lower left corner
Others	
Line: length	Plot or paint
width	In paint mode
Element movement	No
Element duplication	No
Shadowing	No
Text	No
Colour	—
Sizes	—
Positioning	—
File Control	Yes
Directory	No
Load a screen	Yes
Save a screen	Yes
Delete a file	No
Format a cartridge	No
Printer Dump	Yes; special Eigen screen dump
Area printed	User selected using cursor wires
Demo pics supplied	No
Ave. no. files/cart	3
Principal application	General artist package utilising optional scale drawing techniques

## MAXIM

INTEC — price to be announced

Drawing Method	Continuous
Modes	4 only
Colour range	White, red, black or green only
Menu	No
Icons	Yes; 2 pull-up windows
Help pages on screen	No
Aids: Border reference	No
Grid (on select)	No
Cursor co-ord indicator	No
Prompt Window	Yes
Image Pan/Scroll	No
Element Move/Reposition	Yes; cut-and-paste method
Image magnification	No
Auto mirror image	No
Pen direction indicator	No
Drawing tools:	
Pen	Yes
Width control	Yes; 4 widths available
Brush - sizes	Yes; 4 sizes available
Airbrush	Yes
Erase	Yes
Auto fill - on select	Yes
Command access	Utilising icon selection
Method of entry	Cursor keys and space bar or joystick/fire button
Cursor on screen	1; arrow to locate drawing position; drawing tool to produce lines
Control	Cursor keys/space bar or joystick/fire button
Movement	Single pixel increments
Turtle graphics	Yes
Type	Drawing tool symbol
Auto Colour Change	No; must be over-drawn
Auto Geometrics	Yes
Rubber banding	Yes
Circle	Yes
Ellipse	No
Arc	Yes
Box	No
Triangle	No
Others	No
Line: length	Infinite or rubber-banded
width	4 standard widths available
Element movement	No
Element duplication	Yes
Shadowing	No
Text	Yes
Colour	In any one of the four colours available
Sizes	One size only
Positioning	3 stage; infinite text-cursor
File Control	Yes
Directory	No
Load a screen	Yes
Save a screen	Yes
Delete a file	No
Format a cartridge	No
Printer Dump	Yes
Area printed	Entire screen
Demo pics supplied	No
Ave. no. files/cart	3
Principal application	Making high-resolution drawings to be reproduced on a printer for general document illustration



# QL AD

symbols used in other areas of specialised draughting by writing a string into a SuperBasic procedure. Applications of QCAD include such diversified fields as field archeology, communications, flowcharts, plumbing, heating, pneumatics, mechanical and electrical engineering.

Providing the draughtsman with a powerful tool, the QCAD operating system enables the user to place up to 20 repeatedly-used symbols into an addressable array. Less-frequently-used symbols are addressed by their "catalogue" number, whereupon they are drawn at the current cursor position.

Sensibly, QCAD is limited to either green or white ink; draughtsmen are usually limited to black. The features included on screen are logical, sequential and enormously helpful. The Micracle Systems screen

dump supplied with QCAD produces the least horizontal to vertical aspect ratio distortion of the packages in this survey.

A massive 56K program, *Paint Master*, available from Shadow Games, is applicable in areas where a large number of illustrations are required to be included in a user's SuperBasic programs. Illustrations made with Paint Master are saved as a group of co-ordinates, as opposed to the more usual screen dump files; between 30 to 60 pictures, depending on their complexity, can be contained on one cartridge.

Intended originally to be used by authors of text games for adding a greater degree of player involvement, Paint Master is supplied with a set of useful programs which will convert a drawing into a form usable by SuperBasic commands. Users can select either four or eight colour modes from within the program and the drawing board contains the full range of drawing aids and prompts. A full-colour palette is available by either basic colour selection or by the use of the superb stipple generator.

Two features exceptional to Paint Master are the use of two cursors which can be used individually — and toggled — or can be linked; the second feature provides a useful method of duplicating specific drawing elements within an overall drawing and at different scales and positions. Erasing occurs by deleting drawing segment entries successively.

*Art Master*, from Micr\_A\_Soft, is a mode 8 only general artists' program. Derived from Design Board, Art Master can be used in either continuous drawing or plotting modes. Either way, sketches made on graph paper convert readily to the screen by using the features found in the package.

Of special interest to those producing abstract illustrations for use as backgrounds for the primary drawing or as computer art, screen slides of which can be included in audio-visual presentations, one Art Master mode, Image Designer, requires the user to enter a sequence of co-ordinates. The automatically-produced drawing is reminiscent of a cross between drawing with fractals and spirograph.

In common with Design Board, Art Master uses the Eigen screen dump and differs not only in that it provides a single, full-page printout from a complete screen but also makes provision for selective printing by the replacement of on-screen cursor wires.

A newcomer to the graphics scene, the Intec *Maxim* draws in mode 4 only and all commands are entered by use of the space bar or joystick 'fire' button. Because of its presentation of an uncluttered screen, Maxim's feature-packed options are not immediately apparent until full use of the program is made. When loading is completed, all the user sees is a white drawing area, at the bottom of which is a single, screen-wide prompt window. To the right in that window is a colour name — default of black — a pencil symbol and a line-width reminder — 1, on default.

The left end of the window contains two words, Options and Options II. Only when the cursor is moved to the Options window and the space-bar is clicked does the care and attention to detail in the program become immediately apparent.

## QL PAINT

Sinclair Research

<b>Drawing Method</b>	<b>Continuous or plot</b>
Modes	Mode 8 only
Colour range	0 to 7 plus stipples and textures
Menu	No
Icons	Yes
Help pages on screen	No
Aids: Border reference	No
Grid (on select)	No
Cursor co-ord indicator	Optional
Prompt Window	No
Image Pan/Scroll	No
Element Move/Reposition	Yes
Image magnification	Yes; 16 times
Auto mirror image	Yes; vertically, horizontally or 180° rotate
Pen direction indicator	No
<b>Drawing tools:</b>	
Pen	Yes; may be defined as colour or texture
Width control	Yes
Brush — sizes	No
Airbrush	Yes; realistic splatter effect
Erase	No; must be over-drawn with required colour
Auto fill — on select	Yes; 2-stage
Command access	Two-letter typed code or Icons
Method of entry	Keyboard or joystick (the latter with icons only)
Cursor on screen	1; variable size
Control	Cursor keys or joystick
Movement	Continuous; single pixel increments
Turtle graphics	Yes
Type	3 types; optional cursor colour change
Auto Colour Change	No
Auto Geometrics	Yes
Rubber banding	Yes
Circle	Yes
Ellipse	Yes
Arc	No
Box	Yes; from a single point at cursor position
Triangle	No
Others	No
Line: length	Yes; may be defined as colour or texture
width	Yes
Element movement	Yes
Element duplication	Yes
Shadowing	No
Text	Yes and underlining facility
Colour	0 to 7
Sizes	2
Positioning	Directly on screen before pressing <ENTER>
File Control	Yes
Directory	Yes
Load a screen	Yes
Save a screen	Yes
Delete a file	Yes
Format a cartridge	No
Printer Dump	Yes; can be user-modified for particular applications
Area printed	Entire screen
Demo pics supplied	3
Ave. no. files/cart	3
Principal application	Comprehensive artist package



Best-described as a user-friendly program, two pull-up icon menus are provided by either of the Option selects which enable the user to enter the command modes for drawing tool, colour, line widths, text, auto fill, cut-and-paste and file control.

Once the required options are selected, the icon menu drops back off-screen and the arrow cursor can be moved back to the area required. Clicking the space-bar changes the cursor into the symbol of the drawing tool selected — pencil, airbrush, eraser or paintbrush. Text can be moved round in a similar manner, where it is 'fixed' by pressing the space bar again.

What can anyone say about *QL Paint*? Similar in most respects to the Talent *GraphiQL*, from which it is derived, except for the inclusion of icon pull-down menus, the program contains sufficient features to fill many articles about drawing; the documentation fill 124 pages.

Virtually every conceivable option is available to the illustrator for producing professional-quality pictures, rivalling, and in many cases surpassing, programs available only on more expensive computers and costing considerably more.

Drawing in mode 8 only, *QL Paint* draws in one of two modes — the JAM mode, where over-writing occurs in true colour representation, or XOR mode, where over-writing occurs in an alternative colour not common to either of the two original colours.

One of the many options included is a facility for producing either solid colours or drawing either in one of the supplied textures or user-defined textures. Either mode can be performed with a solid or multi-coloured pen, or a solid or multi-coloured fill command. Virtually any combination of drawing techniques may be employed to complete a finished drawing.

Of special note is the superb documentation. Supplied in a loose-leaf binder, the instructions cover all of the aspects of the program in great and careful detail. A section of the handbook covers general information for illustrators using computer drawing more effectively.

Last, but certainly not least, is the Psion *QDraw*. While a real drawing package in its own right, *QDraw* realises its greatest potential as a drawing toolkit. That is not surprising because it owes its origins to an in-house designing aid.

Line widths are continuously variable and drawing is performed almost entirely using single-key entry. In use, the utilisation of turtle graphic commands like <F1>/<F2> for pen up/down becomes readily apparent. *QDraw* has the facility for dropping coloured shadows or performing what can only be described as sliding one drawing beneath another.

Other features included are two-stage magnification, selective colour-changing, saving small sections of a drawing for building a library of useful shapes, duplicating elements of a drawing, mirroring and moving entire sections of a drawing.

One point worth remembering is that any drawing saved as a screen dump can, with most of the programs included in this survey, be loaded into each other for addition or modification utilising program features

perhaps not found in the originating program.

What of the future? Current editions of the programs will almost certainly evolve. New releases will reflect the interest shown by professional artists and designers who, with the aid of programmers fluent in 68000 code, will bring their expertise to the fore.

It is possible that the *QL* will never be able to produce true three-dimensional modelling. It is possible that three-dimensional rotation or manipulation as seen on computers relying on almost unlimited memory may never become a reality; but the operative word is possible.

# QL AD

## QDRAW

Psion £14.95

<b>Drawing Method</b>	Continuous
<b>Modes</b>	4 or 8; pre-selected before loading
<b>Colour range</b>	0, 2, 4 and 7; 0 to 7
<b>Menu</b>	Yes
<b>Icons</b>	No
<b>Help pages on screen</b>	Comprehensive
<b>Aids: Border reference</b>	No
Grid (on select)	Mode 4 only; independent of drawing
Cursor co-ord indicator	No
Prompt Window	No; overprinted on background as required
Image Pan/Scroll	No
Element Move/Reposition	Yes
Image magnification	Yes; 8 times and 16 times
Auto mirror image	Vertically through centre; left side onto right
Pen direction indicator	No
<b>Drawing tools:</b>	
Pen	Yes
Width control	Yes; infinitely variable
Brush — sizes	No
Airbrush	No
Erase	No; must be over-drawn with required colour
Auto fill — on select	Yes
<b>Command access</b>	Command letters
Method of entry	Keyboard
<b>Cursor on screen</b>	1
Control	One of 8 letter keys or cursor keys
Movement	1 or 5 pixel increments
Turtle graphics	Yes
Type	'+' continuous or flashing, '.' or cross-wires
<b>Auto Colour Change</b>	Yes
<b>Auto Geometrics</b>	No
Rubber banding	Lines only; cursor can be switched from one end of a line to the other
Circle	No
Ellipse	No
Arc	No
Box	No
Triangle	No
Others	No
Line: length	Yes
width	Yes; by utilising the cursor-expand feature
Element movement	Yes
Element duplication	Yes
Shadowing	Yes
<b>Text</b>	No
Colour	—
Sizes	—
Positioning	—
<b>File Control</b>	Yes
Directory	Yes
Load a screen	Yes
Save a screen	Yes
Delete a file	Yes
<b>Printer Dump</b>	Yes; negative screen dump (black prints as white)
Area printed	Entire screen
<b>Demo pics supplied</b>	Yes; composite screen of useful shapes
<b>Ave. no. files/cart</b>	3
<b>Principal application</b>	General drawing package; Artist toolkit



# OPENING

## Printer Question

I am using a QL for business with some degree of success and have written several programs to produce works orders, sales records and related documents such as standard letters and invoices. I now need to design various items on-screen and dump to printer. The printer is Taxan/Kaga KP-810. Can you please tell me if it is possible to obtain a screen dump routine and incorporate it into existing programs.

P. E. Thurlow,  
Poole, Dorset.

## ... And Answer

In need of a program for a screen dump, I wrote my own. Although it worked well enough, it took so long to print that I was afraid my printer would become obsolete before it was complete.

It then occurred to me that perhaps I could make use of the screen dump program included on the Easel Microdrive. A little investigation revealed the existence of a machine code program called GPRINT\_PRT which can be loaded and used via the "LBYTES" command. That has proved very successful, and I include a listing which works well with my Epson RX80/FT printer. Some points to note:

The area of the screen printed-out includes part of the normal command area, so it is wise to adjust the windows of the default and command screens as shown.

The file GPRINT\_PRT can be copied from the Easel cartridge to any Microdrive cartridge via the normal COPY command, e.g., COPY mdv1\_GPRINT\_PRT to mdv2\_GPRINT\_PRT.

The printer serial port must be closed before use.

The CLEAR command must be used first if the screen dump is part of another SuperBasic Program. In that case it is also necessary to find the number allocated to "scrnprt" — e.g., by print scrnprt in a test program — and using it directly in the CALL statement.

This operation will convert the printer to ½in. line spacing and it must afterwards be reverted to normal spacing by a separate command.

Robin Pitcher,  
Dinas Powis,  
S. Glamorgan.

100 REMark SCREEN DUMP  
PROGRAMME

110 CLEAR

120 scrnprt=RESPR(1312)

130 LBYTES mdv1\_gprint\_prt,scrnprt

140 WINDOW 448,230,32,10

150 WINDOW #0,448,15,32,240

160 WINDOW #2,448,230,32,10

170 CALL scrnprt

## Advanced Driver

In reply to the letter headed Print Problems in the March, 1986 issue. There is a simple way of changing the printer driver on Easel. The problem is that people let themselves be governed by the system. First define your objective, then see if you can first work outside the parameters set down in the manual, I did and it saves so much head-banging.

Load the file (printer.dat) by the use of LBYTES to the beginning of screen 131072, then do a hard copy of the first 500 locations using PEEK, PRINT and ! to space it sensibly.

You then have a copy of the code involved in decimal; just circle all the number 27s (ESC), the command codes to the printer. The one or two numbers which follow the 27 tell the printer to switch to a mode etc. Write them and compare them to your printer manual.

Some will mean nothing but you can bet that most will. For instance, I have a Smith-Corona d100 which, unlike the FX80, thinks that 27 65 8 or Esc A 8 means set the line space to ½in. Hence the gaps in the graphs. So count the bytes on the paper, poke 4 into the correct place, do a hard copy to check, work out where the file ends on the screen — look for recurring number pattern. Then SBYTES it in place of the original.

The program is only 10 or so lines using a loop. I also think it might help people overcome their system-induced tunnel vision if they write their own routine. My apologies to anyone I may have offended but anger is a powerful motivator.

Hugh Spencer,  
Halstead,  
Essex.

100 OPEN #3,ser1

110 CLS

120 LBYTES mdv1\_printer.dat,131072

130 FOR a = 1 TO 500 STEP 1

140 S = 131071 + a

150 p = PEEK(s)

160 PRINT #3,p,!

170 END FOR a

## Pass the Source

I received from you on Microdrive Exchange the DIY assembler which I assumed would allow me to type-in the various machine code programs which have appeared in *QL User*. Wrong! It seems that before I can use the assembler I must first prepare a source program. What is a source program, why is it needed and, more important, how do I prepare it? The instructions say that it should be prepared using Quill. I do not understand. Can you please enlighten a novice such as myself?

I do not want particularly to program in machine code — only to have the ability to type-in published programs.

G. Boxer,  
Tintagel,  
Cornwall.

*Editor's reply:* It would be an extremely laborious process to write a program in machine code which is simply a sequence of binary numbers. Instead, programs are written in assembly language and this *source code* is compiled into machine code by an assembler program, like the one available from the Microdrive Exchange.

The machine code program in *Sinclair QL World* are mostly in the form of assembly listings i.e., source code. The DIY assembler uses Quill as it's editor. Using Quill, you must type in the listing and save it to microdrive in the usual fashion. Then load and run the DIY assembler, which will ask for the name of a source file to be assembled — the file you have created with Quill.

When the assembly is complete the program will indicate any errors and you should correct them in the original source file, again using Quill. Once an error-free assembly is obtained, the machine code can be saved to a separate microdrive file.

## CAD In Perspective

Best wishes on the new combined publication. I am an architect in private practice and I bought my QL in August, 1984. I am using my unexpanded QL successfully with a Microvitec monitor, Epson RX 80 F/T printer and Microdrive storage only.

I use Quill for letters, standard forms and reports; Archive is used to store information on all previous and current projects; Abacus is invaluable for all kinds

of calculations from complex sewer systems — very glamorous — to fee accounts and structural calculations; while easel has been used to give a graphic comparison of tender figures for projects.

One thing I discovered quickly is that, while I enjoy tinkering with SuperBasic, what I really want is well-written software which I simply load and use to do work. The Psion package has improved the speed and presentation of many aspects of my work.

What would really fulfil my dreams would be a program which would project simple perspectives from which presentation drawings could be prepared. When I saw the preview in your January/February issue which held out the promise of information on computer design packages I could scarcely wait for January 21. When it did not arrive I consoled myself with the thought that computer journalists must need more than the usual amount of time to recover from Christmas and New Year parties, but at least I would get the gen on my beloved design package in February. Wrong!

Could you tell me whether anyone is working on a program to produce 3D perspective projections? The other types of computer drafting programs like QDraw seem more geared to those who want to create screen pictures for inclusion in games or business software. That is almost useless in the type of application I require. I am not looking for an Acropolis or Rucaps type system, but even a simple program could be very useful.

John McKevitt,  
Newry.

*Editor's reply:* It was not a hangover which delayed us, just that it takes time to produce a true comprehensive guide, which you will find starting on page 7.

## Never Too Old

I am one of those persons who could be classed as too old — at 66 — to learn computing, so I set out before Christmas to see what the market had to offer, my enthusiasm being sparked by the new Amstrad word processor being advertised. You will be pleased to know I settled for the QL. I must admit learning programming will be a little daunting, as machine code and SuperBasic do not mean very much to me.

Journalism is my hobby now that I have retired from travel. As a word processor I



# H A N N E L

thought perhaps a computer could be of use to me in the creation of stories and articles which I could store and retrieve at will. When I began to make enquiries I was amazed at the wide range of computers on the market and how little the sales people knew about the technical side of what they were selling. So I started by looking on the newstands at the user magazines, which seemed always to be monopolised by students all having a good read on the cheap. That put me on the right track.

The QL won my vote on price and its capability. I thought, rightly as it has proved, that it would give me a good computer as well as a word processor. I also hoped to be able to get some French and Spanish language programs but so far I have had no success. For a monitor I selected a 14in. Sony with RGB on the front which I can use as a television set if I wish, and it is good in either mode, F1 or F2.

Getting to grips with the manual at first was a little difficult. With the help of *QL User* and experiences of some of your readers I was able to understand eventually some of the technicalities. A little practice and I got the thing working after getting locked up and locked out and some bad names during the first two weeks.

After that it was easy. I finally mastered Quill. The next stage was to buy a printer. The prices and range was a little off-putting but *QL User* came to the rescue once more and I purchased a Centronics GLP. It has lived up to its word.

The installation was not so easy. At first, no matter what I did, the printer would not work until I realised that baud rate and dip switches had to be understood. The December issue of the *QL User* had a letter in it from G. Slatter, who described the dip switch settings and put me on track. Even then nothing worked at first, which made me suspicious of the QL serial lead but the trouble became evident to me after I spent some time trying to make something of the 16 dip switches and found that I had the serial lead switch in the OFF position.

After that I had no trouble. Installing the printer had me guessing for a time and sometimes the printer would print one line over another halfway through a document. That I overcame by advancing the line feed before printing. Once or twice I have lost documents in memory and from the Microdrive, never really knowing how, but as time passes that does

not happen so much, as I have learned to forstall it, hence the good advice of making back-ups of important documents.

Having saved about 50 documents on four Microdrives, deleted, edited and reorganised my files, I would like to say how delighted I am with the performance of both the QL and the GLP. The QL does some strange things when I am editing a long document, such as breaking-up and refusing to re-line again and overloading the memory, but now that I have had a considerable amount of practice it produces superb results.

I had difficulties in obtaining new ribbons, as no-one seemed to stock them. I telephoned some of the advertisers in *Sinclair QL World* and was quoted £7.95. Dixons got me some for £3.49.

Although I am well-satisfied with the package I have put together, my only criticism is of the sloppy QL keyboard. Sir Clive Sinclair has a winner in the computer field, if only the keyboard worked as smoothly as some I have tried. The small Microdrives hold a good deal more than people realise. On balance, if it goes on giving me good service, I am more than satisfied, but if an improved keyboard QL is marketed I shall certainly choose it.

**W. E. G. Brockman,  
Whitstable,  
Kent.**

## Screen Switch

I have programmed in machine code almost seven months since I bought my Metacomco assembler and now I have some problems. I have tried unsuccessfully to find answers to my problems from my machine code books and from my *QL User* magazines.

Is there any way to turn off the screen, so if I write something to the screen memory it does not affect the TV or monitor screen until the screen is turned on again? I know that I can write a machine code program to do that but with my talents it would be too slow.

Then I want to know if it is possible to move the QL second screen from the system variables to the free RAM so that I can use it.

**Mikael Honkala,  
Loviisa,  
Finland.**

*Editor's reply:* Bit 0 of the master chip status register at \$18063 controls the screen. Set

this to 1 to blank the display and 0 to re-enable it; setting bit seven of the same address switches the screen to its second location on top of the system variables. It is not possible to move it, and it can therefore be used only in supervisor mode.

## University Archives

Sandwich degree courses which incorporate periods of industrial training in addition to the students' academic studies hold many advantages for students and employers alike. In these days of unprecedented levels of unemployment, the procurement of training places is a major problem for many educational establishments. In the Department of Mathematics and Computer Studies at Dundee College of Technology a new computerised system using the QL has been developed to assist the placement officers.

User-friendly software has been written using Archive procedures to enable the system to be used with ease. A company database has been developed, with each record containing 36 fields, so that relevant information about present and potential employers may be maintained. An attractive screen display for each record has been obtained using SEDIT, so I can assure Keith Tearle that 32 fields per record is not too many for Archive.

Separate student files are maintained and each record contains the student's name, home and term address, and vacancies applied for. Cross-reference between company and student files is obtained by using a company code variable. Extensive use has been made of the SEDIT facility and operation of the system generally involves the selection of a particular option from a displayed menu.

The system has three main uses. The first is the day-to-day data management used to examine, alter or insert information into the company or students' databases. The second use is the production of a number of standard reports, which enables an instant analysis of present or past placement information to be obtained.

Before the introduction of the computerised system, any analysis of the data needed laborious sifting through a variety of card index boxes; consequently reports were produced only on a yearly basis, so no accurate information was

readily available at interim points in time.

The third use is the production of a number of standard letters and address labels. The controlling procedures insert the information regarding the company contact and address into the appropriate standard letter, with a cut-sheet feeder used for continuous production. Previously, standard letters were duplicated in bulk and the departmental typists inserted names and addresses. That was very time-consuming and unfortunately the typed name and address contrasted sharply with the duplicated part of the letter.

Our system was developed using a standard QL but I do not believe that Microdrives are suitable for very heavy use and the dreaded bad or changed medium message occurs too often for complete confidence. I maintain three back-ups but have decided to use disc drives and am eagerly awaiting their arrival. It occurs to me that a memory expansion and RAM disc configuration would be a worthwhile investment and that is being considered.

**Dr. Stuart Donald,  
Dundee College of Technology.**

## Basic Archiving

May I rave about Archive which I find a really excellent programming language, much better than the little of Database II I have seen? The only problems one gets from it are those relating to understanding Basic programming techniques, in particular the use of pointers in file handling. For example, after doing a WHILE-ENDWHILE on a condition, the current record pointer is indicating the record after the last one for which the condition was true and not the last one of the condition.

If you are in doubt about where the pointer is, slip in a PRINT RECNUM() command and you can then usually work out what has happened. In reply to Keith Tearle, *Sinclair QL World* March, the only problem I have had with screen layouts on Version 2 is that SINPUT will not accept input from the last character position of an input field, which means that all fields have to be made one character longer than the maximum entry required, but, I must admit I have never had as many as 32 fields.

**Julie Benson,  
London SW16.**



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# OF MICE & MENUS

**W**IMPS — windows, icons, mice and pointers — have been a part of the computing environment long enough for the initial excitement surrounding their introduction to have subsided. Microsoft's Gem and Apple's Mac have both proved the desirability of such systems, while at the same time setting the standard for those to follow.

WIMPS software offers a user-friendly front end which permits the operator to carry-out basic housekeeping tasks without having to resort to the computer operating system. Information is presented on the screen in the form of graphic icons. To carry-out a particular task, the user moves a pointer, usually controlled by a mouse, to the relevant icon and presses a button.

The theory behind WIMPS is that it should be simple enough to enable someone with little or no knowledge of the operating system to carry-out disc filing and other essential tasks. To that end, a parallel is drawn between using the computer and running an office. In addition to facilitating filing operations through the use of everyday symbols, extras such as a calculator, calendar and clock are often provided.

WIMPS, however, should not be regarded purely as an aid to the computer illiterate. It provides a useful tool for anybody wishing to carry-out what can often be tedious, mundane operations in a fast, convenient manner, which leads us neatly to the subject of the QL.

Given the popularity of the machine in business circles, combined with its cumbersome command syntax, it is perhaps surprising that it has taken until now for what can truly be called WIMPS to appear.

Eidersoft's Icon Control Environment made its first appearance in the latter part of last year. The addition of a professional-looking mouse will undoubtedly make it a more attractive option for those who wish to escape the tedium of SuperBasic file handling.

As well as the mouse Eidersoft are providing Their article graphics package. The mouse compatible software enables freehand designs to be created and features interchangeable brushes, block copying, geometric designs, area fill, and other useful functions.

The software for the mouse has been incorporated neatly into a ROM cartridge only slightly larger than the one which housed the original ICE. It protrudes about 3cm. from the ROM socket, trailing a metre of cable to which is attached the mouse. In operation, the mouse performs admirably, moving the pointer smoothly round the screen with no sign of flicker. Moving the mouse about 12cm. carries the pointer the width of the screen. It is therefore possible to operate the mouse on

top of the QL Microdrive panel, although a desk-top would be preferable.

On power-up with the ICE ROM in place, the centre of the screen is occupied by the main window, with icons displayed in the border area to the left and bottom of the screen. They show the storage devices — microdrives, floppy and RAM discs — calculator, calendar, a bin for file deletions and an ESCape button.

Other functions are represented in text form on a bar across the bottom of the screen. They include options to re-name files, customise ICE parameters such as the mouse click repeat time, change the device names and set the system clock. While some of those functions are purely cosmetic, enabling users to tailor the software to their preference, most provide useful enhancements without you having to think too much about it. The clock, for example, date stamps each file directory entry whenever it is updated.

**(R)** Until recently the preserve of machines like the Apple and Atari, Icon driven software and mice have now arrived on the QL.  
**(E)**  
**(V)**  
**(I)**  
**(E)**  
**(W)**



Moving the pointer to a device icon and clicking the right-hand button displays a directory in the main window. Different icons are used to distinguish between file types and if the directory is of more than 12 entries the remainder are displayed on subsequent pages. Once the directory has been loaded it is a simple matter to carry-out filing operations. The file on which you wish to work is highlighted by placing the pointer over it and single-clicking with the left button on the mouse; it then becomes the current file for all operations.

Performing the same operation on an active file causes it to become inactive. In that manner it is possible to select a number of files on which a single

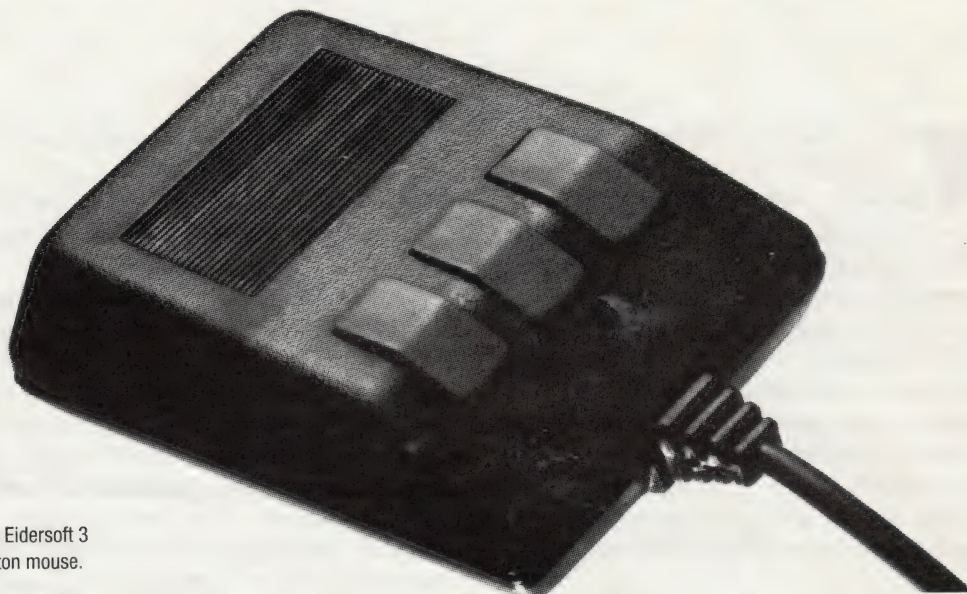
The ABC alternative. Fewer buttons, but more bulk.



command can be performed. Both EXECutable files and SuperBasic programs can be run from within ICE by placing the pointer over the file and clicking the right-hand button. A more recent feature is the autoboot facility, which will allow you to load, for example, Quill, in the normal manner, with the ICE ROM present, thus preventing you having to go through the ICE routines.

connected in the same manner, are two more leads. One of them is the connection to CTRL1, the other takes power from the ROM socket.

With the mouse connected and the QL switched-on, EASE boots-up in the usual way. Icons are displayed on the right of the screen and the pull-down menu bars across the top. EASE is very much more window- and menu-orientated than ICE. It is possible to exercise



The Eidersoft 3 button mouse.

There are a number of facilities in addition to the general housekeeping functions. The view option, selected from the menu bar, outputs the contents of an active file to a small window. Because of the limitation of the small window size, it is possible to examine only a small part of the file at any time. The complete thing can be viewed section by section, using the MORE button, and output to the printer is obtained in the same manner. It is difficult to see how this facility could be of great use, other than to examine SuperBasic listings or files created using the Psion packages. In either case a more acceptable output could probably be obtained in the conventional manner.

Of similarly dubious value is the calculator. While ease of operation is considerably improved by the presence of the mouse — the pointer is positioned over the relevant keys and input is displayed on the imitation LED screen — I cannot imagine anyone wanting to use it in preference to the genuine article. More useful is the calendar. As well as providing information for the date-stamping of updated files, it is possible to page back and forth through the months and check on particular day/date combinations.

The only other mouse-driven, icon-based system which could be described realistically as an ICE alternative is the ABC Electronic EASE, or Easily Applicable System Environment. The complete package comprises the mouse; EASE software on Microdrive; and Giga-Basic, a SuperBasic extension.

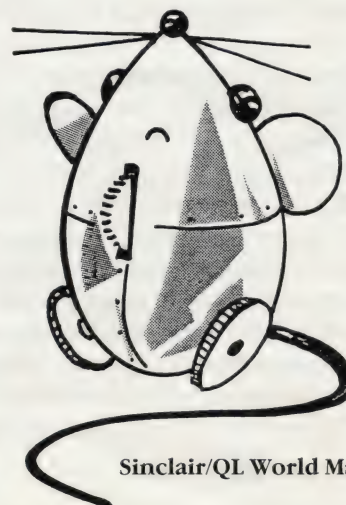
The first thing to strike one about the hardware is its ungainly appearance. The two-button mouse is neat enough — about the size of a cigarette packet and raised at the rear. — but the method of connection is extremely messy. The lead terminates in a D-plug which fits into one end of the interface, a black box about the same size as the mouse. At the other end,

greater control over how information is presented, although that is not necessarily desirable.

Working upwards from the bottom of the screen, the final three icons represent storage devices — the two Microdrives and a third device which can be configured by the user. Moving the pointer over the disc symbol and clicking provides an icon-based directory window. Up to seven window directories can be displayed simultaneously and therefore it is possible to examine the contents of several devices without clearing the screen.

With so many windows on the screen, things may become confusing and the EASE dustbin performs the function of closing the topmost window. It is not used to delete files, as that function is provided on a pull-down menu.

The remaining icons are all concerned with the manipulation of windows on the screen. The duplicator allows a copy of the window to be displayed on another part of the screen, so that separate parts of the page can be worked on simultaneously. Windows can be





# OF MICE & MENUS

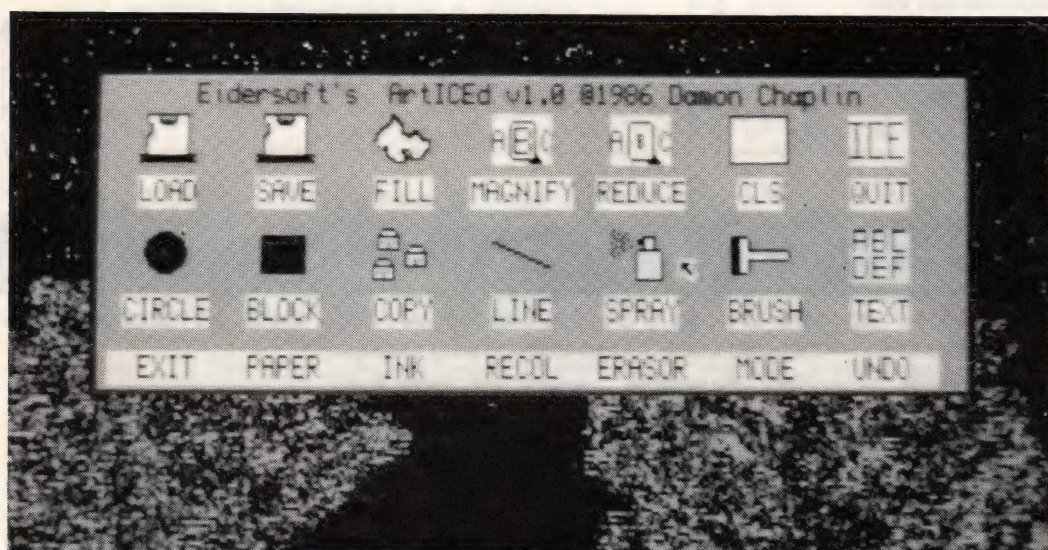
REVIEW



There is, however, no option to change the speed at which the pointer moves.

It is difficult to make a straightforward comparison of ICE and EASE as they differ, not only in individual aspects, but in their approach to the whole idea of desk-top systems. ICE has the edge in terms of available options and its structure is altogether tighter, making it easier for the novice to assimilate. Neither is there any question that the Eidersoft mouse is a superior product to its ABC counterpart.

EASE, on the other hand, has more flexible window facilities and will probably appeal more to those who prefer a greater degree of control over how their information is formatted on output. At 210DM, which is roughly £60, it is considerably cheaper than ICE, though a straight price comparison may not be totally relevant, depending on your preference for Extended Basic as against the ARTice graphics package.



ARTice. Mouse Assisted Design.

enlarged or reduced and their contents scrolled in any direction. Therefore it is possible to have a page much bigger than the window through which it is viewed. Finally, the windows can be positioned anywhere within the screen area.

Just as icons are used exclusively for window commands, housekeeping operations are performed under control of Mac-style, pull-down menus. In all, there are five. Moving the pointer to the first, marked DESK, and clicking pulls down the menu. That particular menu offers the choice of a scientific function calculator or a sliding puzzle-type game. The other four menus have several more useful functions to call on, including file deletion and copying, formatting, sorting, and view.

Like ICE, EASE can be customised to suit your particular requirements. The default media can be switched from Microdrive to floppy discs, the scroll speed of the windows can be altered, as can the speed with which windows are moved about the screen.

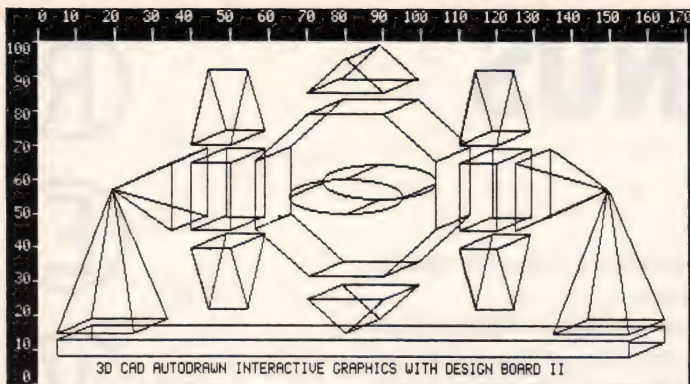
Users with RAM expansions and disc drives will be tempted to opt for ICE, as it offers the possibility of multi-tasking with the CHOice software which costs £14.95. That permits use of all four Psion packages — or any other EXECable programs — concurrently, provided you have adequate memory space, and allows switching between them.

Having used both systems, my preference is for ICE. Being ROM-based it is more convenient to use and it has all the facilities one could reasonably expect. When used in combination with the Choice software it transforms the QL into a powerful, multi-tasking workstation which is difficult to fault.

Eidersoft, The Office, Hall Farm, N. Ockendon, Upminster, Essex RM14 3QH. ICE, Mouse and ARTice £89.95 or £65 if an ICE Cartridge is traded in. CHOice multi-tasking software £14.95.

ABC Elektronik, Huegelstr 10-12, 4800 Belefeld 1, West Germany. Giga Soft Mouse, EASE and Giga-Basic 210DM ex postage.





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# RAM DISC

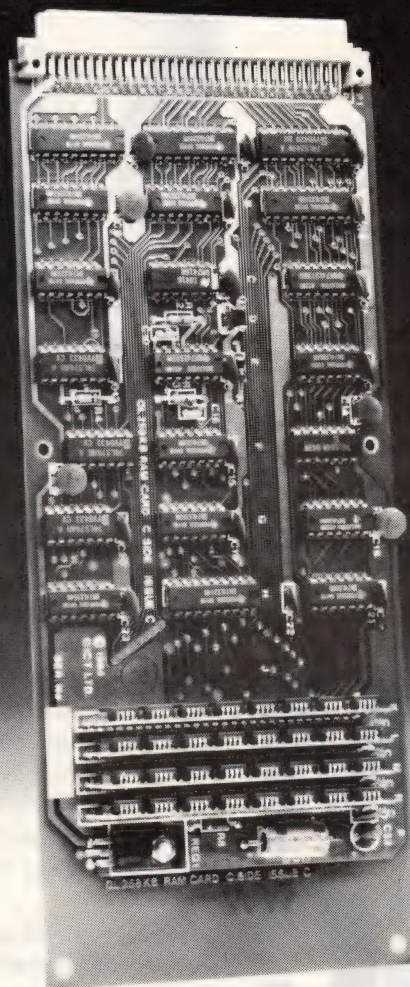
## Is memory expansion and RAM disc software a viable alternative to floppies? Leon Heller investigates the options.

Now that relatively low-cost memory expansions of 256K and 512K are available from several suppliers, together with RAM disc software, many users will be interested in whether this approach is a viable alternative to the purchase of a floppy disc interface and disc drive.

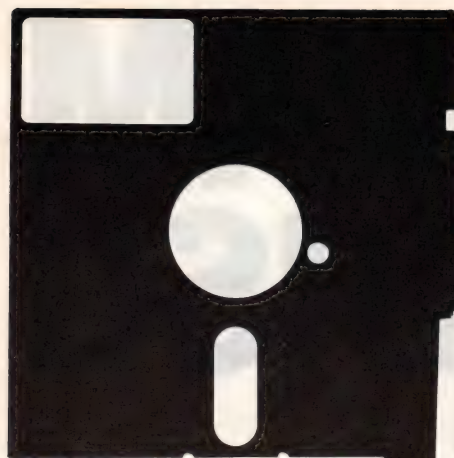
The term RAM disc might be unfamiliar to some users, so a brief explanation is needed. A RAM disc is an area of memory which has been configured to behave like a very fast disc. Just like discs — and Microdrives — a RAM disc must be formatted before use. The memory allocated to the RAM disc is then unavailable to programs, which might be important if you create a large RAM disc and are also trying to run large programs — you might run out of memory even with a 512K RAM expansion.

Another point to watch is that since the contents of RAM are lost when the machine is re-set or turned off, any data held in the RAM disc which you want to retain must be saved to Microdrive or disc or it will be lost irretrievably. It is also advisable periodically to save files which are being modified, in case there is a power cut or, more likely, someone trips over the mains lead to the power supply and the plug is pulled out.

Most of the RAM disc software available from various suppliers has been written by Tony (Qdos) Tebby of Qjump, who supplied me with the latest version of his software on disc. RAM disc software not from Qjump should not be markedly different from the Qjump product. Some suppliers of disc and memory expansion interfaces provide the RAM disc driver software as part of the interface EPROM, so that it is available whenever

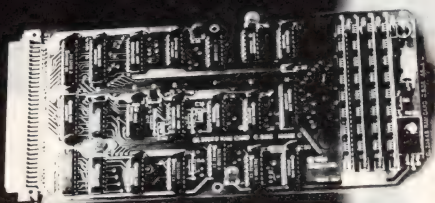






the interface is plugged into the machine. It is available on disc or Microdrive from suppliers of memory expansions.

My copy of the Qjump RAM disc driver was accompanied by four pages of documentation, starting with a section for beginners who are new to the concept, followed by sections on RAM disc compatibility with the



QL Toolkit filing system extensions, RAM disc creation, heap fragmentation, Microdrive emulation, and two programs for copying Quill and other files from Microdrive to a RAM disc, and copying files back to a Microdrive at the end of a session.

Loading the RAM disc software from disc or Microdrive is very simple and is best done as part of a "boot" program, when the machine is re-set or powered-up. A

program — after the RAM disc has been formatted, of course.

If you need to make the memory allocated to a RAM disc available as ordinary RAM, any RAM disc can be removed by formatting it with either a null name or zero sectors, as in "FORMAT ram2\_" or "FORMAT ram2\_0". Of course, any files within the RAM disc are lost and should be saved to Microdrive or floppy disc before removing the RAM disc.

The Qjump product I have been using has several other useful features; extended filing system commands from the QL Toolkit and Microdrive emulation are provided. The Microdrive emulation means that the Psion packages may be used with RAM discs without modification, since the command "RAM\_USE mdv" will change the name of the RAM disc driver to "mdv", instead of "ram". When Quill is used, for instance, all commands which previously accessed the Microdrives will operate on RAM disc files. You have to remember to transfer your document files from Microdrive to RAM disc, of course, and save them back to Microdrive when you have finished.

When memory is being allocated and re-allocated, as happens when RAM discs are created and removed, a phenomenon called "heap fragmentation" often



Miracle Systems 512K RAM — disc software is optional.

small amount of memory is reserved with RESPR, about 1,900 bytes of machine code are loaded, and then CALLED. That is almost instantaneous.

With the RAM disc driver loaded, up to eight RAM discs may be created using the FORMAT command. For instance, "FORMAT ram2\_200" will create a RAM disc called ram2, with 200 512-byte sectors (100K) of storage. All the usual file-handling commands may then be used with the RAM disc, by using the device name "ram2" in place of the usual "mdv1" or "mdv2". Thus, to copy a file named "fred" from Microdrive 1 to the RAM disc, you type "COPY mdv1\_fred TO ram2\_fred".

Once a file is loaded into RAM disc, it can be accessed very much faster than from Microdrive or disc. Any files which need to be loaded into RAM disc are best loaded like the RAM disc driver, as part of the "boot"

reduces the amount of available memory. The latest Qjump RAM disc driver has some code incorporated which reduces the amount of fragmentation which occurs but it is best to leave RAM discs as they are, when they have been created, until the machine is re-set.

By using the Psion packages with RAM disc, wear and tear on Microdrive cartridges should be reduced substantially and they should therefore last very much longer.

On a 512K QL; two RAM discs, one of 630 sectors (315K) and another of 50 sectors (25K), leave more than 120K of RAM free. Therefore it is feasible to load most of the Metacomco Lattice C compiler — the two compiler modules, text editor, linker, and library files — into the larger RAM disc, with the source code files in another RAM disc, and use the system for serious

# RAM DISC



software development without spending upwards of £200 for a single disc drive and interface.

A 512K external RAM expansion can be obtained for around £125, so a saving of £75 is possible and you have the benefit of a total 640K of RAM, with faster operation due to the external memory. RAM discs are very much faster than floppies, greatly speeding the process of compilation and linking. The only disadvantage is that the compiler and other files must first be loaded into the RAM disc from Microdrive, which takes several minutes. That need be done only once at the start of a session, however, and the reduction in time

the Metacomco Lattice C, or the Prospero Software Pro Fortran, but many users will find 256K adequate for use with the Psion packages.

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# RAM DISC



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when going through the usual edit-compile-link-test cycle when developing software with a compiler is considerable. Similar increases in productivity can be obtained with other compiled programming languages of course, such as Pascal and Fortran, as well as assembly language.

If you have disc drives, RAM disc capability is still very useful. All the benefits mentioned still apply, although the time savings will not be so dramatic, because of the speed of discs compared to Microdrives, especially when dealing with large files. Operation with a single drive becomes perfectly feasible, however, since discs can be backed-up by copying all the files to a RAM disc, swapping discs, and copying all the files to the new disc. All the benefits mentioned, when using large complex pieces of software like compilers, still apply when using discs.

Apart from the initial loading of the files at the beginning of the session and saving the files at the end, there will be no difference in speed between machines, with discs and machines with Microdrives, and a 512K QL with RAM discs will easily out-perform a standard QL with floppies when used in this manner.

Summing-up, it would appear that an expanded QL with RAM disc software and Microdrives is a viable alternative to a standard QL equipped with discs and is even better in some respects, because of the increased speed of reading and writing files to and from RAM disc, compared to floppy discs. A 512K expansion is advisable, especially if you intend to use products like

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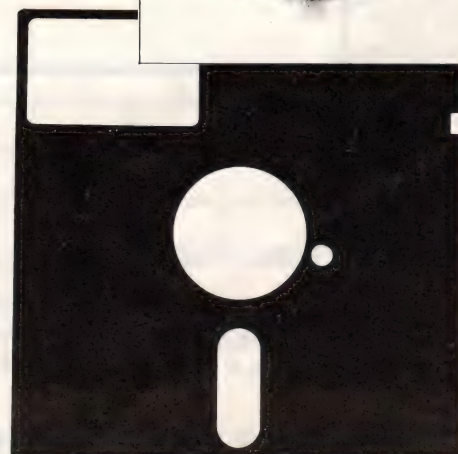
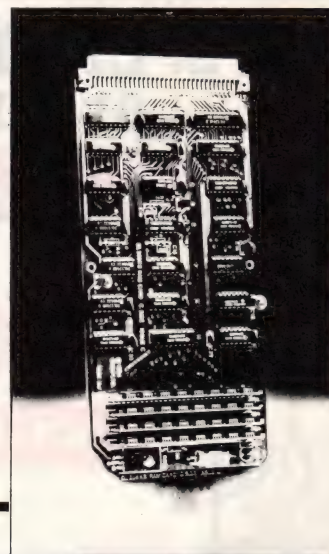
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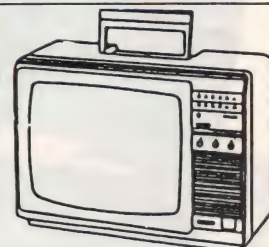
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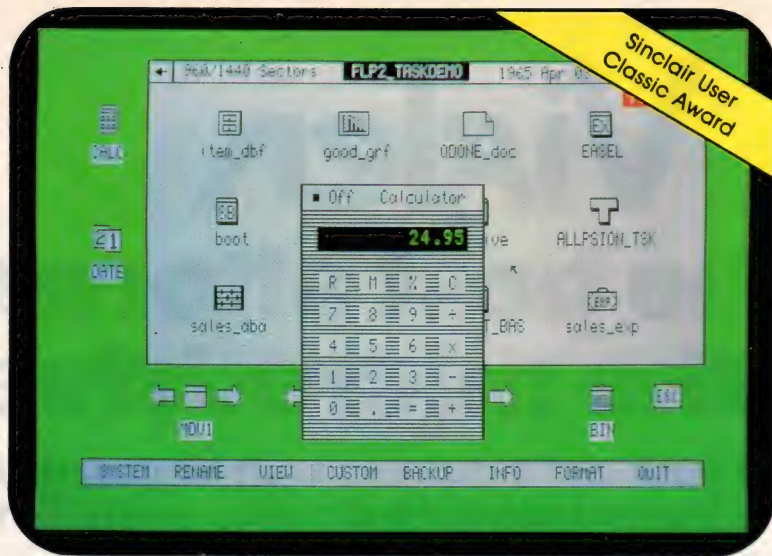
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
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 QL/5



## In the concluding part of our Go feature Marcus Jeffery demonstrates the use of evaluation techniques with a SuperBasic version of the game.

We dealt with the rules of the game of Go last month and saw why conventional tree-searching methods for finding the computer's move are hopelessly inefficient. So what alternatives are there? The program listed below uses a static evaluation technique. In other words, it tries to find a reasonable move without using any look-ahead tree. In all, there are six evaluations:

```
PROCEDURE group_evaluation
PROCEDURE defend_connection
PROCEDURE attack_connection
PROCEDURE start_attack
PROCEDURE start_connection
PROCEDURE find_any_move
```

Those six procedures are tried, in order, with evaluation terminating as soon as a particular procedure finds a possible move. The latter method helps to increase the average speed of the program by ensuring that subsequent procedures are not evaluated for every move. Nevertheless, the SuperBasic program is still somewhat slow, having to check many possibilities on each move, and would benefit greatly from compilation.

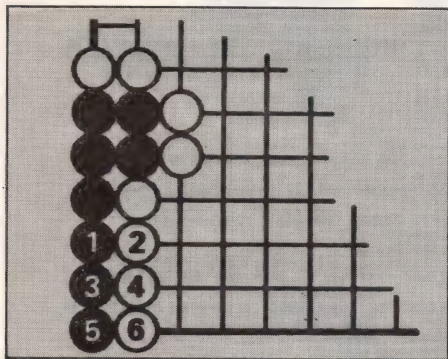


FIGURE 1.

The most important evaluation procedure is "group\_evaluation". It will check all the groups on the board, looking for any which are in 'critical' situations. A critical situation occurs if any group has only one or two liberties. If that is the case, the computer will play on to one of the liberty positions.

Unfortunately, it is still possible that could try to save a lost group. That could occur, say, from the position in figure one, where the computer (black) will play the sequence of moves 1, 3, 5, but will still lose the group. Without at least some form of look-ahead, however, it is impossible for the computer to decide whether or not any group is 'dead' — i.e., ultimately lost. You will notice that the other evaluation procedures check to ensure that *clib%* — the number of liberties — is greater than two, before playing the move.

When performing group evaluation, the procedure 'count' is called. That calls a recursive procedure, 'search' is called for the new stone; edges, created by the edge of the board, or the opponent's stones; empty intersections — i.e., liberties of the group.

That method resembles a 'filing' algorithm, marking — using 'marker%' — each stone or liberty which has previously been checked, to avoid infinite recursion. Using a more complex filling algorithm would require significantly more code but may operate slightly faster, especially for larger groups. A common such algorithm is the 'Scan-Line Algorithm' which works by filling 'runs' — horizontal lines — stacking the end points of the run for subsequent filling.

The next four evaluation procedures all try to find a move using pattern-matching techniques. The stone patterns which they use are shown in figure two, though it is sometimes necessary to hold more than one orientation of the non-symmetric patterns. In all cases, 'stone&1' is the current evaluation position. That is governed by the loop 'gl', which scans the entire board.

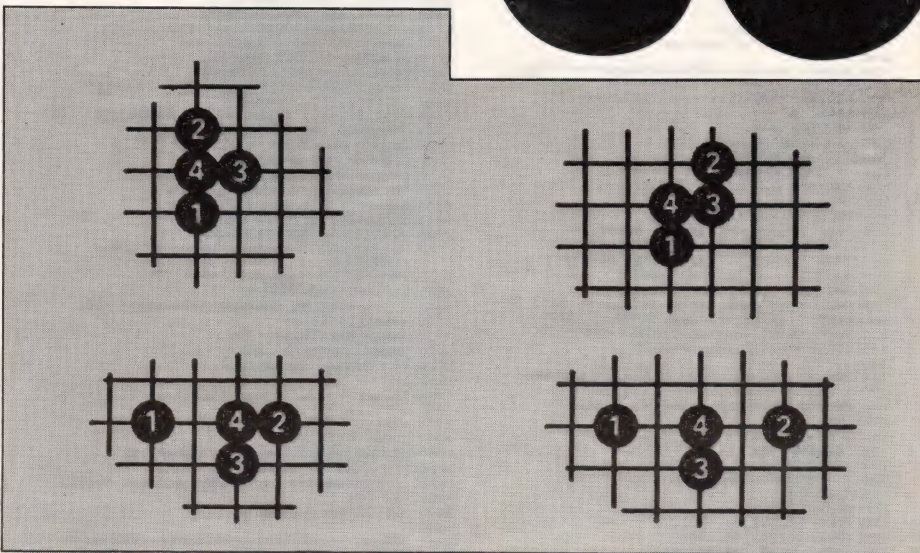


FIGURE 2.

The purpose of all the procedures is to defend, attack and start stone connections. They are not adjacent stones, but stones which are separated only by a few squares. Thus, if this 'weak line' were to be attacked by the opponent, a player would be able to connect the stones properly. It is very rare during the opening sequences to find players placing adjacent stones to surround territory.

Figure three shows how the four-stone group on the left has surrounded only two vacant intersections — territory — but by using loose-connections, a similar number of stones can surround 23 points. Using patterns, the computer is encouraged to defend, attack and build those connections. The procedures analyse the positions in the following manner:

```
DEFEND_CONNECTION
IF point#1 = Black
  AND point#2 = Black
  AND point#3 = White
THEN try to play at point#4
ATTACK_CONNECTION
IF point#1 = White
  AND point#2 = White
  AND point#3 = Black
THEN try to play at point#4
START_ATTACK
IF point#1 = White
  AND point#2 = White
  AND point#4 = Empty
THEN try to play at point#3
```

*continued p.29*

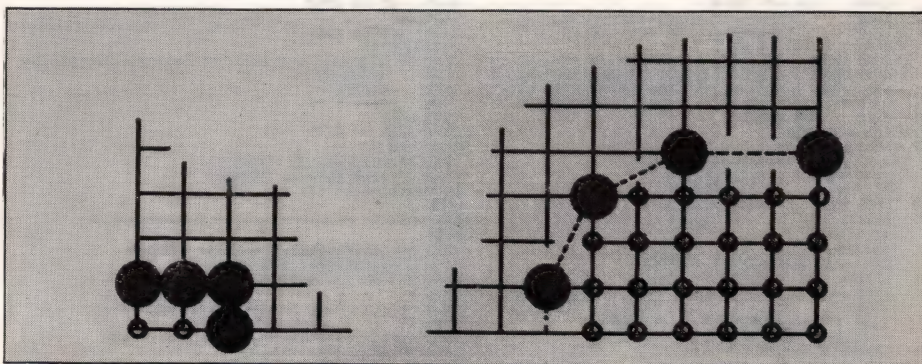


FIGURE 3.



```

100 MODE 8
110 initialise
120 introduction
130 print_board
140 white_move
150 IF finish THEN GO TO 180
160 move:=moveZ+black_move
170 IF NOT finish THEN GO TO 140
180 ans:=input$(9,1)
190 IF ans="Y" THEN GO TO 120
200 IF ans(">"N) THEN GO TO 180
210 message 5, ""
220 CLOSE#3;CLOSE#4;CLOSE#5;CLOSE#6;CLOSE#7
230 STOP
240 :
250 REMark *****
260 :
270 DEFINE PROCEDURE initialise
280 LOCAL i
290 blackZ=1 : whiteZ=2 : colourZ=3
300 markerZ=4 : libertyZ=8
310 board=RESPR(256);weight=RESPR(256)
320 DIM captureZ(2),clockZ(2),tlocZ(2)
330 DIM a$(8)
340 read_messages
350 read_handicaps
360 read_patterns
370 DIM dirZ(4)
380 RESTORE 420
390 FOR i=1 TO 4
400 READ dirZ(i)
410 END FOR i
420 DATA 16,1,-16,-1
430 END DEFINE initialise
440 :
450 REMark *****
460 :
470 DEFINE PROCEDURE read_messages
480 LOCAL m
490 RESTORE 540
500 DIM messZ(9,42)
510 FOR m=0 TO 9
520 READ messZ(m)
530 END FOR m
540 DATA "O.K. THINKING..."
550 DATA "Illegal Entry: "
560 DATA "Stone already on point: "
570 DATA "Illegal. Ko on point: "
580 DATA "Illegal. Suicide on point: "
590 DATA " O.K. GAME OVER."
600 DATA ""
610 DATA "How many handicap stones (2-9)? "
620 DATA "Type your move, PASS or QUIT : "
630 DATA "Want to play again (Y/N)? "
640 END DEFINE read_messages
650 :
660 REMark *****
670 :
680 DEFINE PROCEDURE read_handicaps
690 LOCAL i,hZ
700 hncp=RESPR(44)
710 RESTORE 750
720 FOR i=0 TO 43
730 READ hZ;POKE hncp+i,hZ
740 END FOR i
750 DATA 68,204
760 DATA 68,204,76
770 DATA 68,204,76,176
780 DATA 68,204,76,176,136
790 DATA 68,204,76,176,132,140
800 DATA 68,204,76,176,132,140,136
810 DATA 68,204,76,176,132,140,72,200
820 DATA 68,204,76,176,132,140,72,200,136
830 END DEFINE read_handicaps
840 :
850 REMark *****
860 :
870 DEFINE PROCEDURE read_patterns
880 LOCAL i,pZ
890 pat=RESPR(72)
900 RESTORE 940
910 FOR i=0 TO 71
920 READ pZ;POKE pat+i,pZ
930 END FOR i
940 DATA 32,17,16,2,-15,1
950 DATA -32,-17,-16,-2,15,-1
960 DATA 32,16,17,31,16,13
970 DATA -32,-16,-17,-31,-16,-15
980 DATA -14,1,-13,18,1,17
990 DATA 14,-1,13,-18,-1,-17
1000 DATA 48,33,32,48,17,16
1010 DATA -48,-33,-32,-48,-17,-16
1020 DATA 3,-14,2,-3,-15,1
1030 DATA -3,14,-2,-3,15,-1
1040 DATA 64,33,32,4,-14,-2
1050 DATA -64,-33,-32,-4,14,-2
1060 END DEFINE read_patterns
1070 :
1080 REMark *****
1090 :
1100 DEFINE PROCEDURE read_weights
1110 LOCAL aZ,bZ,cZ,dZ,xZ,yZ,vZ
1120 RESTORE 1240
1130 FOR y=1 TO 8
1140 FOR x=y TO 8
1150 aZ=16*y*x : cZ=16*y+(16-x)
1160 bZ=16*x*y : dZ=16*x+(16-y)
1170 READ vZ
1180 POKE weight+aZ,vZ;POKE weight+272-aZ,vZ
1190 POKE weight+bZ,vZ;POKE weight+272-bZ,vZ
1200 POKE weight+cZ,vZ;POKE weight+272-cZ,vZ
1210 POKE weight+dZ,vZ;POKE weight+272-dZ,vZ
1220 END FOR x
1230 END FOR y
1240 DATA 0,1,1,2,2,2,2,2
1250 DATA 4,3,3,4,4,3,3,3
1260 DATA 7,7,6,6,3,3,3,3
1270 DATA 7,6,3,3,4,3,3,3
1280 DATA 6,3,4,3,3,3,3,3
1290 DATA 4,3,2,2,2,2,2,2
1300 DATA 2,1,1,1,1,1,1,1
1310 DATA 0
1320 END DEFINE read_weights
1330 :
1340 REMark *****
1350 :
1360 DEFINE PROCEDURE introduction
1370 game_init
1380 set_screen
1390 END DEFINE introduction
1400 :
1410 REMark *****
1420 :
1430 DEFINE PROCEDURE game_init
1440 read_weights
1450 location:=0;moveZ=1
1460 hZ=0;finishZ=0
1470 captureZ(1)=0;captureZ(2)=0
1480 wipe 0
1490 END DEFINE game_init
1500 :
1510 REMark *****
1520 :
1530 DEFINE PROCEDURE set_screen
1540 WINDOW#1,312,236,0,0:PAPER#1,0;CLS#1
1550 REMark *** Board ***
1560 BLOCK#1,242,182,232,16,2
1570 OPEN#3,scr_230x170a236x22
1580 CSIZE#3,2,0:PAPER#3,1;INK#3,5;CLS#3
1590 PRINT#3," ABCDEFGHIJKLMNOP "
1600 FOR i=15 TO 1 STEP -1
1610 i=" ":(LEN(i)-1) TO 1)
1620 PRINT#3,i;FILL#1(" ",15);i
1630 END FOR i
1640 PRINT#3," ABCDEFGHIJKLMNOP "
1650 WINDOW#3,182,150,262,32
1660 PAPER#3,4;INK#3,4;CLS#3
1670 FOR i=1 TO 15:PRINT#3,FILL#1(" ",15);
1680 REHARK *** Capture Window ***
1690 BLOCK#1,194,54,32,16,2
1700 OPEN#4,scr_182x42a38x22
1710 CSIZE#4,2,0:PAPER#4,1;CLS#4
1720 REMark *** Move Record ***
1730 BLOCK#1,194,122,32,76,2
1740 OPEN#5,scr_182x110a38x82
1750 PAPER#5,1;CLS#5;PRINT#5," MOVES"
1760 CSIZE#5,2,0;UNDER#5,1
1770 PRINT#5,"No. Black White";UNDER#5,0
1780 WINDOW#5,182,90,38,102
1790 REMark *** Input Area ***
1800 BLOCK#1,442,24,32,20,2
1810 OPEN#6,scr_430x12a38x208
1820 CSIZE#6,2,0:PAPER#6,1;CLS#6
1830 REMark *** Message Area ***
1840 BLOCK#1,442,24,32,230,2
1850 OPEN#7,scr_430x12a38x236
1860 CSIZE#7,2,0:PAPER#7,1;CLS#7;FLASH#7,1;INK#7,3
1870 REMark *** Handicap Input ***
1880 handZ=input$(17,1)
1890 IF handZ(2) OR handZ(9) THEN GO TO 1880
1900 handicap handZ
1910 INK#5,5;PRINT#5," 1 "
1920 INK#5,0;PRINT#5,"hncp "
1930 END DEFINE set_screen
1940 :
1950 REMark *****
1960 :
1970 DEFINE PROCEDURE handicap (handZ)
1980 LOCAL i,pZ,qZ
1990 qZ=INT((handZ-2)/2)+(handZ+1)*.5
2000 FOR i=qZ TO qZ+handZ-1
2010 pZ=PEEK(hncp+i);POKE board+pZ,blackZ
2020 END FOR i
2030 END DEFINE handicap
2040 :
2050 REMark *****
2060 :
2070 DEFINE PROCEDURE print_board
2080 LOCAL pZ,xZ,yZ
2090 CLS#7
2100 AT#4,0,0;INK#4,5;PRINT#4,"Stones Captured"
2110 cZ=" ":(LEN(cZ)-1) TO 1)
2120 cZ=" ":(LEN(cZ)-1) TO 1)
2130 INK#4,0;PRINT#4," by WHITE:";cZ
2140 INK#4,0;PRINT#4," by BLACK:";cZ
2150 AT#3,0,0
2160 FOR y=15 TO 1 STEP -1
2170 FOR x=1 TO 15
2180 pZ=PEEK(board+16*y*x)
2190 IF pZ=0 THEN INK#3,4;PRINT#3," "
2200 IF pZ=1 THEN INK#3,0;PRINT#3,"O"
2210 IF pZ=2 THEN INK#3,7;PRINT#3,"O"
2220 END FOR x
2230 END FOR y
2240 END DEFINE print_board
2250 :
2260 REMark *****
2270 :
2280 DEFINE FUNCTION finput$(mZ,wZ)
2290 LOCAL sZ,aZ,iZ
2300 aZ="":iZ=0
2310 CLS#6;INK#6,5;PRINT#6,message(mZ);" ";INK#6,7;PRINT#6,aZ
2320 REPEAT get_char
2330 iZ=INKEY#1;CODE(iZ)
2340 IF iZ(">"") THEN EXIT get_char
2350 END REPEAT get_char
2360 IF iZ=10 THEN GO TO 2330
2370 IF iZ(1) THEN GO TO 2450
2380 IF aZ(0) THEN
2390 sZ=sZ+iZ
2400 aZ=aZ+iZ TO aZ)
2410 GO TO 2330
2420 ELSE
2430 GO TO 2320
2440 END IF
2450 IF (iZ(9)=6) AND (iZ(123) THEN iZ=CHR$(iZ-32)
2460 IF aZ(9) THEN
2470 sZ=sZ+iZ
2480 aZ=aZ+iZ TO aZ)
2490 ELSE
2500 GO TO 2320
2510 END IF
2520 PRINT#6,iZ;GO TO 2320
2530 IF aZ(0) THEN GO TO 2310
2540 RETURN aZ
2550 :
2560 REMark *****
2570 :
2580 DEFINE PROCEDURE message (mZ,aZ)
2590 CLS#7;PRINT#7,message(mZ);aZ
2600 END DEFINE message
2610 :
2620 REMark *****
2630 :
2640 DEFINE FUNCTION fprint_to_char$(pZ)
2650 IF pZ(0) THEN RETURN "Pass "
2660 aZ=" ":(LEN(aZ)-1) TO 1)
2670 RETURN aZ(1) TO 5)
2680 END DEFINE fprint_to_char
2690 :
2700 REMark *****
2710 :
2720 DEFINE PROCEDURE white_move
2730 LOCAL cZ,lZ,pZ,xZ,yZ,aZ,cZ,yZ
2740 aZ=input$(8,4);aZ=aZ
2750 IF aZ="PASS" THEN kolZ=0;pZ=-1;GO TO 2880
2760 IF aZ="QUIT" THEN finishZ=1;GO TO 2900
2770 xZ=CODE(aZ(1))-64
2780 yZ=aZ(2) TO 5)
2790 FOR c=1 TO LEN(yZ)
2800 c=ysc(c)
2810 IF c(">"0" OR c(">"9" THEN message
1,aZ;GO TO 2740
2820 END FOR c
2830 yZ=yZ
2840 IF xZ(1) OR xZ(15) OR yZ(1) OR yZ(15) THEN message 1,aZ;GO TO 2740
2850 pZ=16*yZ+xZ;lZ=legality(pZ,whiteZ)
2860 IF lZ(0) THEN message 1Z,aZ;GO TO 2740
2870 make_move pZ,whiteZ
2880 message 0, ""
2890 INK#5,7;PRINT#5," :fprint_to_char$(pZ)
2900 END DEFINE white_move
2910 :
2920 REMark *****
2930 :
2940 DEFINE PROCEDURE black_move
2950 bZ=0
2960 group_evaluation
2970 IF bZ=0 THEN defend_connection
2980 IF bZ=0 THEN attack_connection
2990 IF bZ=0 THEN start_attack
3000 IF bZ=0 THEN start_connection
3010 IF bZ=0 THEN find_any_move
3020 IF bZ=0 THEN bZ=-1;GO TO 3040
3030 make_move bZ,blackZ
3040 nZ=" ":(LEN(nZ)-2) TO 1)
3050 INK#5,5;PRINT#5,nZ;" "
3060 INK#5,0;PRINT#5,fprint_to_char$(bZ);
3070 END DEFINE black_move
3080 :
3090 REMark *****
3100 :
3110 DEFINE PROCEDURE group_evaluation
3120 hZ=-999
3130 FOR gp=17 TO 235
3140 gZ=PEEK(board+gp) && colourZ
3150 IF gZ(0) THEN
3160 count gp,gZ;IF clibZ(2) THEN GO TO 3270
3170 tlocZ(1)=clockZ(1)
3180 tlocZ(2)=clockZ(2)
3190 glZ=clibZ(gZ);catnZ
3200 FOR gp=1 TO glZ
3210 IF legality(tlocZ(gp),blackZ)=0 THEN
3220 score=(800Z/gZ)-clibZ(2)+glZ
3230 IF score(hZ) THEN hZ=score;blZ=tlocZ(gp)
3240 END IF
3250 END FOR gp
3260 END IF
3270 END FOR gp
3280 END DEFINE group_evaluation
3290 :
3300 REMark *****
3310 :
3320 DEFINE PROCEDURE find_any_move
3330 hZ=-999
3340 FOR gl=17 TO 235
3350 score=RND+PEEK(weight+gl)
3360 IF (gl && 240) AND (gl && 15) AND score(hZ) THEN
3370 IF legality(gl,blackZ)=0 AND clibZ(2) THEN hZ=score;blZ=gl
3380 END IF
3390 END FOR gl
3400 END DEFINE random_move
3410 :
3420 REMark *****
3430 :
3440 DEFINE PROCEDURE defend_connection
3450 hZ=-999
3460 boundary blackZ
3470 FOR gl=1 TO 235
3480 gaZ=PEEK(board+gl)
3490 IF gaZ=blackZ THEN
3500 FOR pt=pat TO pat+70 STEP 3
3510 gbZ=PEEK(board+(gl+PEEK(pt)) && 255))
3520 gcZ=PEEK(board+(gl+PEEK(pt+1)) && 255))
3530 IF (gbZ=blackZ) AND (gcZ=whiteZ) THEN
3540 gdZ=(gl+PEEK(pt+2)) && 255
3550 score=PEEK(weight+gdZ)+RND
3560 IF (gdZ && 240) AND (gdZ && 15) AND (score(hZ) THEN
3570 IF legality(gdZ,blackZ)=0 AND clibZ(2) THEN hZ=score;blZ=gdZ
3580 END IF
3590 END IF
3600 END FOR pt
3610 END IF
3620 END FOR gl
3630 boundary 0
3640 END DEFINE defend_connection
3650 :
3660 REMark *****
3670 :
3680 DEFINE PROCEDURE attack_connection
3690 hZ=-999
3700 boundary whiteZ
3710 FOR gl=1 TO 235
3720 gaZ=PEEK(board+gl)
3730 IF gaZ=whiteZ THEN
3740 FOR pt=pat TO pat+70 STEP 3
3750 gbZ=PEEK(board+(gl+PEEK(pt)) && 255))
3760 gcZ=PEEK(board+(gl+PEEK(pt+1)) && 255))
3770 IF (gbZ=whiteZ) AND (gcZ=blackZ) THEN
3780 gdZ=(gl+PEEK(pt+2)) && 255
3790 score=PEEK(weight+gdZ)+RND

```



```

3800 IF (pZ% < 240) AND (pZ% < 15) AND
(score>0) THEN
3810 IF legality(pZ%,blackZ)=0 AND clibZ>2
THEN hi=score+libZ+gZ
3820 END IF
3830 END FOR pt
3840 END FOR gl
3850 END IF
3860 END FOR gl
3870 boundary 0
3880 END Define attack_connection
3890 :
3900 REMark *****
3910 :
3920 Define Procedure start_attack
3930 hi=999
3940 FOR gl=1 TO 255
3950 gZ=PEEK(board+gl)
3960 IF gZ=whiteZ THEN
3970 FOR pt=pat TO pat+70 STEP 3
3980 gZ=PEEK(board+((gl+PEEK(pt)) & 255))
3990 gZ=PEEK(board+((gl+PEEK(pt+2)) & 255))
4000 IF (gZ=whiteZ) AND (pZ%=0) THEN
4010 gZ=(gl+PEEK(pt+1)) & 255
4020 score=PEEK(weight+gZ)+RND
4030 IF (pZ% < 240) AND (pZ% < 15) AND
(score>0) THEN
4040 IF legality(pZ%,blackZ)=0 AND clibZ>2
THEN hi=score+libZ+gZ
4050 END IF
4060 END FOR pt
4070 END IF
4080 END IF
4090 END FOR gl
4100 END Define start_attack
4110 :
4120 REMark *****
4130 :
4140 Define Procedure start_connection
4150 hi=999
4160 FOR gl=1 TO 255
4170 gZ=PEEK(board+gl)
4180 IF gZ=blackZ THEN
4190 FOR pt=pat TO pat+70 STEP 3
4200 gZ=PEEK(board+((gl+PEEK(pt+2)) & 255))
4210 IF gZ=0 THEN
4220 gZ=(gl+PEEK(pt)) & 255
4230 score=PEEK(weight+gZ)+RND
4240 IF (pZ% < 240) AND (pZ% < 15) AND
(score>0) THEN
4250 IF legality(pZ%,blackZ)=0 AND clibZ>2
THEN hi=score+libZ+gZ
4260 END IF
4270 END IF
4280 END FOR pt
4290 :
4300 END FOR gl
4310 END Define start_connection
4320 :
4330 REMark *****
4340 :
4350 Define Procedure make_move (pZ,cZ)
4360 LOCAL aZ,nZ,l
4370 nZ=0:starZ=""
4380 POKE (board+pZ),cZ
4390 FOR l=1 TO 4
4400 aZ=pZ+dirZ(l)
4410 IF PEEK(board+aZ)=colourZ-cZ THEN
4420 count aZ,colourZ-cZ
4430 IF clibZ=0 THEN koZ=aZ:nZ=nZ+
cZ:starZ=starZ+aZ
4440 IF clibZ=1 THEN starZ=""
4450 END IF
4460 END FOR l
4470 IF nZ<>1 THEN koZ=0
4480 captureZ(cZ)=captureZ(cZ)+nZ
4490 print board
4500 END Define make_move
4510 :
4520 REMark *****
4530 :
4540 Define Procedure remove (pZ,cZ)
4550 IF PEEK(board+pZ)=cZ THEN
4560 POKE board+pZ,0:IF cZ=blackZ THEN
POKE weight+pZ,0
4570 remove pZ+dirZ(1),cZ
4580 remove pZ+dirZ(2),cZ
4590 remove pZ+dirZ(3),cZ
4600 remove pZ+dirZ(4),cZ
4610 END IF
4620 END Define remove
4630 :
4640 REMark *****
4650 :
4660 Define Function legality (pZ,cZ)
4670 LOCAL aZ,kZ,sZ,l
4680 sZ=0:kZ=0
4690 IF PEEK(board+pZ)<>0 THEN RETURN 2
4700 POKE board+pZ,cZ
4710 FOR l=1 TO 4
4720 aZ=pZ+dirZ(l)
4730 IF PEEK(board+aZ)=colourZ-cZ THEN
4740 count aZ,colourZ-cZ
4750 IF clibZ=0 THEN kZ=kZ+cZ:nZ=nZ+
cZ
4760 END IF
4770 END FOR l
4780 IF kZ=0 THEN
4790 count pZ,cZ
4800 IF clibZ=0 THEN sZ=4
4810 END IF
4820 POKE board+pZ,0
4830 IF pZ=koZ AND kZ=1 THEN sZ=3
4840 RETURN sZ
4850 END Define legality
4860 :
4870 REMark *****
4880 :
4890 Define Procedure count (pZ,cZ)
4900 clibZ=0 : cZ:nZ=0
4910 cZ:nZ=0 : cZ:nZ=0
4920 search pZ,cZ
4930 wipe colourZ
4940 END Define count
4950 :
4960 REMark *****
4970 :
4980 Define Procedure search (pZ,cZ)
4990 IF clibZ>2 THEN GO TO 5150
5000 IF (pZ% < 240) OR (pZ% < 15) THEN GO TO 5150
5010 IF (PEEK(board+pZ) & colourZ)=0 THEN GO TO 5150
5020 IF (PEEK(board+pZ) & cZ)=0 THEN GO TO 5150
5030 IF (PEEK(board+pZ) & markerZ)>0 THEN GO TO 5150
5040 POKE board+pZ,cZ:markerZ
5050 cZ:nZ=cZ:nZ+1
5060 search pZ+dirZ(1),cZ
5070 search pZ+dirZ(2),cZ
5080 search pZ+dirZ(3),cZ
5090 search pZ+dirZ(4),cZ
5100 GO TO 5150
5110 IF (PEEK(board+pZ) & libertyZ)>0 THEN GO TO 5150
5120 POKE board+pZ,libertyZ
5130 clibZ=clibZ+1
5140 IF clibZ>3 THEN cZ:nZ=cZ:nZ-pZ
5150 END Define search
5160 :
5170 REMark *****
5180 :
5190 Define Procedure wipe (aZ)
5200 LOCAL l
5210 FOR l=0 TO 255
5220 POKE board+l,PEEK(board+l) & aZ
5230 END FOR l
5240 END Define wipe
5250 :
5260 REMark *****
5270 :
5280 Define Procedure boundary (vZ)
5290 LOCAL xZ,yZ
5300 FOR x=0 TO 15
5310 y=16-x
5320 POKE board+x,vZ
5330 POKE board+y,vZ
5340 END FOR x
5350 END Define boundary
5360 :
5370 REMark *****
5380 REMark *****END OF PROGRAM*****

```

#### START\_CONNECTION

IF point#1 = Black  
AND point#4 = Empty  
THEN try to play at point#2

Note that in some cases 'boundary' is called to fill the edge of the board with stones of a particular colour. That is to allow the procedures to make connections, not only with other stones, but with the edge of the board. The board is held in a series of 256 bytes, as shown in figure four. By always logically-ANDing

proof method but it helps to make the computer choose more sensible-looking moves. The 'remove' procedure, which removes groups of captured stones, sets the weight of any intersection, where a black stone has been captured, to zero. That is an attempt to dissuade the computer from playing back on to those often fatal points.

Finally, in the unlikely event that none of the procedures has been able to find a move, the computer passes, setting the play position (bl%) to -1.

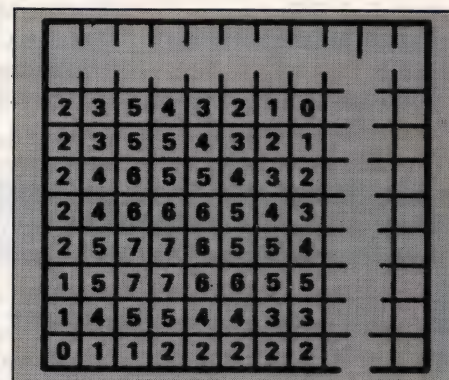


FIGURE 5.

The last message displayed will be the procedure which found the move. At the very least, it will give you something to look at while the computer is thinking.

The program has been designed in modular fashion, making it relatively simple to add your own evaluation procedures. The only procedure which you are likely to need to call is 'legality', where 'p%' is the proposed play — using the board numbers in figure four — and 'c%' is the colour (black%=1, white%=2). Variables used in this procedure are LOCAL, so there should be no difficulties. The procedure returns an integer number, where:

- 0 = Move is legal.
- 2 = Stone already on point p%.
- 3 = Playing into 'ko' position.
- 4 = Suicide on p%. The stone or group would have no liberties.

Those numbers have been chosen to coincide with the error messages in the mess\$ array.

The modular development, and use of byte arrays for many features such as board, weight, handicap and patterns, also makes it reasonably easy to convert separate procedures into machine code, combatting the main weakness of the program — speed.

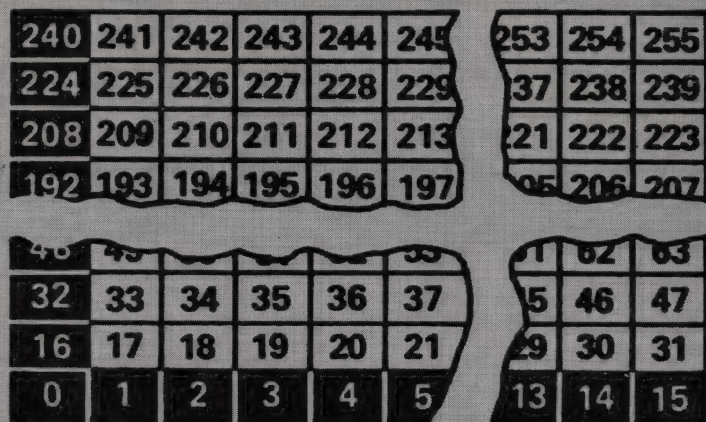


FIGURE 4.

any positions, the single border envelops the entire board.

If none of the pattern evaluations is able to find a move, the catch-all 'find\_any\_move' procedure called. That scans the board, looking for a possible position. In choosing between positions, that procedure — and the pattern-matching procedures — use the 'weight' byte-array. That series of bytes — figure five — associates a value with each board position, depending on its importance. It is by no means a fool-

It is often helpful to know why the computer chose a particular move. By adding the following lines, the computer will display the current evaluation technique in the bottom window:

3115 message 6, "Group Evaluation"  
3325 message 6, "Finding any move"  
3445 message 6, "Defend Connection"  
3685 message 6, "Attack Connection"  
3925 message 6, "Start Attack on Connection"  
4145 message 6, "Start New Connection"



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## QL COMMUNICATIONS

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- \* Full emulation of colours, mosaics, separated mosaics, etc.
- \* Save displayed page to file on microdrive or disk.
- \* Save entire session to file on microdrive or disk.
- \* Replay, create or edit saved pages whilst off-line.
- \* Transmit a saved file.

PLUS

VT52 (Scrolling terminal) - for use with Bulletin boards, electronic mail services, mainframe computers, etc.

- \* 80 column (4 colour), or 40 column (8 colour) modes.
- \* VT52 control codes, for fancy editors, etc.
- \* Additional control codes to set display colours.
- \* Alternate keypad emulation.
- \* Upload or download text files using standard utilities on host.
- \* XON-XOFF protocol.

PLUS

- \* QL to QL file transfer. Any file transferred from disk or microdrive, including executable files, Quill documents, etc.
- \* Error detecting and correcting protocol.

**QL MODAPTOR ..... £39.00**

- \* Links QL to 300/300, 1200/75, 1200/1200 modem. eg WS2000, PRISM 1000 & 2000, NIGHTINGALE, DATACHAT, VOYAGER 11.
- \* Includes QCODE TERMINAL software.
- \* State modem type when ordering if not 25 way connector.

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**QCODE GAMES ..... £4.95**

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Voyager 7 with modaptor & software . Phone for details

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## QCODE

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**Telephone: 0235 28359**

## QEP III Advanced EPROM Programmer

The QEP III EPROM programmer was designed specifically to meet the need for a highly reliable means of programming EPROMS. It is cased, with resident firmware in ROM and fits in the QL expansion slot or an expansion unit.

QEP III provides verification of EPROMS at 4V 4.3V 4.7V 5V 5.3V 5.7V and 6V: under and over voltage verification is essential for reliable EPROM service. It also features fast programming at voltages of 12.7V, 21V and 25V.

QEP III can program 16k to 512k EPROMS with standard pinouts, or the data and address pins may be re-assigned for ease of PCB layout.

QEP III can program EPROMS for multiple EPROM sets without any need to reload the data and it can program just part of an EPROM.

QEP III is fully menu driven, making it not only powerful but easy to use.

## QMON Monitor Debugger

QMON II is the debugger for the QL: only QMON II has all the features essential for effective machine code debugging.

QMON II has a single line assembler / disassembler - not just the simple disassembler of other monitors, but a complete memory editing MC68000 assembler for correcting or patching code.

QMON II has comprehensive trace facilities - not just single stepping, but multi stepping, invisible trace, back trace and a macro command executable every trace step. You can trace to a printer or a file.

QMON II has comprehensive breakpoints - not just on instruction addresses, but on register values and memory values as well. With the invisible trace, you can even breakpoint ROM.

QMON II has pull-down windows - not just the fixed windows of other monitors but windows that restore the QL's screen after use, so that QMON can be used with programs that use the screen themselves.

## QTK II Super Toolkit

QTK II, the QL Super Toolkit, is a rewritten version of the original QL Toolkit.

QTK II has full networking for file serving, messaging etc., PRINT USING, wild card copying, deletion etc., Programmable keys, last line recall, SuperBASIC editor, default directories, alarm clock etc., etc., etc.

Essential for all serious QL program developers and educational establishments, it is available in ROM and (in a configurable form but without the network facilities) on Microdrive or floppy disk.

## GRAM RAM Based Utilities

GRAM is not just another fast RAM disk for the QL. GRAM is a set of utilities to get the most out of your expansion RAM.

GRAM includes a dual function RAM disk, a general purpose printer buffer, an instant access print spooler, resident file system maintenance utilities and more besides. All are designed specifically to multitask even with the PSION programs.

## QFLP Upgrade

QJUMP is the foremost supplier of QL floppy disk interface software. Upgrade your Sinclair / Micro Peripherals disk interface to the standard.



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Please add £2.00 for 3 1/4" disk.  
All prices include VAT at 15%.

For more information on these and other QJUMP products, please send an SAE.

If your QL dealer does not have the products you require, you may order direct, using ACCESS/Mastercard or cheque with order. Please add £1.00 pp (UK) or £2.00 pp (UK) for ROM version QTK II.



# PUZZLE PAGE

Resident problem poser Marcus Jeffery outlines an economic problem of intergalactic proportions on which to test your wits.

Welcome to the greatest meeting of minds our galaxy has seen. With the expansion of the colony worlds to neighbouring systems, transport and communication have become a pressing problem. Though we now have the means of hyperspace transport through the sub-ether matter transporters, their cost is still very prohibitive but I can now tell you that the colony worlds have formed a giant consortium to build a complete transport network.

You have been gathered here to bid for management of this enormous project. The winner will be whoever can devise the cheapest network. In addition to management of the project, you will receive the ultimate accolade of a

year's subscription to that intergalactically-renowned magazine, *Sinclair QL World*.

As you know, a single matter transporter will work only in one direction, so each colony system must have at least one such device, connecting to an output port in the destination system. All the raw material, labour costs, and so on, have been compiled into a table, shown in figure one. So, to build a link from colony 'H' to colony 'E' would cost 33 billion credits, whereas the reverse link would cost only 27 billion credits.

You must devise a network of hyperspace links which connect every planet to every other. When doing that, it is feasible to travel from one planet to another via a third — rather than having a direct link — if that will reduce costs. One consideration which you should bear in mind is that the hyperspace transporters are not, as yet, 100 percent efficient. Therefore at least two distinct routes should exist between any two planets, as a fail-safe

against one of the links malfunctioning.

Having devised your least-cost network which satisfies those constraints, fill in the form, entering the total cost as the sum of all the links. Additionally, so that your entry can be checked for correctness, could you enter a number into each box on the entry form indicating the quantity of each link you would buy. For instance, if you felt that a circular network was best, connecting AB, BC, CD, DE, EF, . . . KL, LA, your entry form would look like the one in figure two. Unfortunately, a single break in this inflexible network would mean disaster; it certainly does not meet the fail-safe constraint.

## RULES

All entries must be written on the panel provided on this page. Any other form of entry will be disqualified. Entries must be sent by post to:

Puzzle Page,  
Sinclair QL World,  
79-80 Petty France,  
London SW1H 9ED

to arrive no later than Friday, May 17, 1986. Please mark the envelope 'Network Puzzle'.

The winner will be the first correct entry drawn from the editor's input port.

All entries will be judged by the Editor, whose decision is final.

## ENTRY FORM

		To Colony →											
		A	B	C	D	E	F	G	H	I	J	K	L
F	A	X											
R	B		X										
O	C			X									
M	D				X								
	E					X							
C	F						X						
O	G							X					
L	H								X				
O	I									X			
N	J										X		
Y	K											X	
	L												X

Total Cost = \_\_\_\_\_ billion credits.

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Figure 1.

		To Colony →											
		A	B	C	D	E	F	G	H	I	J	K	L
r	A	**	7	43	37	26	42	17	2	23	28	9	7
o	B	25	**	50	40	10	16	2	28	39	16	30	30
m	C	49	27	**	4	50	4	3	1	12	4	44	4
	D	29	41	41	**	38	12	5	37	42	49	41	47
C	E	10	12	13	1	**	42	35	27	2	11	18	15
o	F	42	39	3	36	41	**	38	3	7	35	28	42
l	G	21	5	29	31	38	47	**	30	12	49	11	48
o	H	42	25	5	32	33	34	36	**	7	39	17	30
n	I	2	12	20	18	11	42	30	24	**	5	1	10
y	J	12	4	18	8	37	49	33	32	50	**	5	15
↓	K	29	23	10	40	28	11	39	20	35	6	**	13
	L	44	40	24	12	27	47	3	16	32	15	8	**

(Costs shown in billions of credits)

Figure 2.

		TO COLONY											
		A	B	C	D	E	F	G	H	I	J	K	L
F	A	X	1	0	0	0	0	0	0	0	0	0	0
R	B	0	X	1	0	0	0	0	0	0	0	0	0
O	C	0	0	X	1	0	0	0	0	0	0	0	0
M	D	0	0	0	X	1	0	0	0	0	0	0	0
	E	0	0	0	0	X	1	0	0	0	0	0	0
C	F	0	0	0	0	0	X	1	0	0	0	0	0
O	G	0	0	0	0	0	0	X	1	0	0	0	0
L	H	0	0	0	0	0	0	0	X	1	0	0	0
O	I	0	0	0	0	0	0	0	0	X	1	0	0
N	J	0	0	0	0	0	0	0	0	0	X	1	0
Y	K	0	0	0	0	0	0	0	0	0	0	X	1
	L	0	0	0	0	0	0	0	0	0	0	0	X

Total Cost = 239 billion credits



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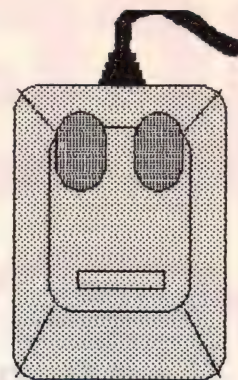


# ABC Elektronik

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proudly presents the Giga Soft

## Mouse for the SINCLAIR QL



The Giga Soft Mouse comes in a ready-to-use package including a high quality mouse (resolution 0.01"), an interface for the joystickport of the QL and a software package.

*The software consists of the following programs:*



## Giga – Basic (Tested in QL USER 1/86 p. 58)

A totally new type of Basicextension for the SINCLAIR QL. It adds more than 70 new commands to SuperBasic. Features:

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### New Giga Soft Software Soon available:

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# TDI LANGUAGES



**A**lthough the QL has yet to make a name for itself as a games machine, the more professional language software market is very competitive. Metacomco is one of the leading names in the field, with five language packages — Lisp, Pascal, Assembler, C and BCPL. A lesser-known but prolific range is available from TDI Software Ltd.

The two major TDI language products are UCSD Pascal and Fortran-77, along with an Advanced Development Toolkit for more serious users. The main inducement to opting for the TDI packages is that all the languages are based round the universal P-system. So what is the P-system?

## P-SYSTEM

Developed by SofTech Microsystems in San Diego during the late 1970s, the P-system is a universal working environment for small computer systems. The P-system is by no means exceptional to the QL but runs on a wide range of 8-bit to 32-bit processors, providing standard compilers for Pascal, Fortran-77 and Basic. The advantage is that files written on the QL can be transferred easily to any other computer running the system, making software extremely portable.

Rather than compiling programs to machine code,

the compilers produce P-code, for use on a theoretical P-machine, though native code can be produced for time-critical operations. The P-code files are completely processor-independent, allowing portability of programs across any machine running the P-system.

The major disadvantage with compilation to P-code is that it tends to run more slowly than its machine code equivalent, requiring a P-code interpreter to be executing. If memory is a problem, however, P-code is, on the whole, more compact than machine code. Also if you can afford the optional Advanced Development Toolkit, you will also have a Native Code Generator for converting P-code programs to 68000 code.

All micros running the P-system have exactly the same working environment, with the same commands for editing, running and filing software. Those commands are operated from a hierarchy of menus. Working from the top of the structure, a number of options are available, including Help, Edit, Run, Compile, Assemble, Debug and Filer.

Having selected any of them, you will find yourself either in the appropriate command or at a further level. For instance, choosing Edit displays a second-level menu, with such options as Adjust, Find, Insert, Delete and so on. That hierarchy of commands is shown in

UCSD Pascal,  
Fortran-77 and  
Advanced  
Development Toolkit  
from TDI Software.  
Reviewed by Charles  
Gerrard.





figure one, giving some indication of what is available in the P-system environment.

When booted, the P-system operating system displays the level one "Command Menu" — Edit, Filer, and the like. For compatibility with other systems, the menu is shown on the top line of the display, rather than making use of such QL-specific features as windowing, and so on. That makes the system much easier to use for anybody familiar with the P-system but very difficult for beginners. For instance, when in Edit mode, you will have access to a full screen editor. Choosing Insert will allow you to insert text into a file and at that point the top line menu displays that:

```
<bs>  {backspace} deletes a character
<del>  {delete} deletes a line
<etx>  {edit accept key} to make the insertion
<esc>  {escape} to reject the insertion
```

## QL Compatibility

That is all very well but, unfortunately, the QL has no 'edit accept key' and uses CTRL-backspace for delete. In those cases, CTRL-C will perform <etx> operation and CTRL-Q will delete a line. If you have not used the P-system previously on any other machine, you are likely to find that rather confusing initially.

The wealth of documentation which accompanies the software is very comprehensive. Unfortunately it is so verbose that finding the piece of information you need can be difficult. In general, the manuals are designed for reference and the one book which is definitely missing is a general users' guide. Nevertheless, persevering, two of the manuals refer to the screen editor. Having checked carefully through them, you will be no wiser but — credit where credit is due — eventually the Owners' Handbook tells you which keys are which.

Fortunately, the P-system can run in either of two configurations. The standard configuration displays the top-line prompts I have mentioned, providing complete compatibility with any other systems. The second option allows the P-system to work with other applications programs to display user/machine-specific displays and prompts.

TDI has documented the configuration which is has developed for use on the QL in the QL Owners' Handbook, so anybody with the appropriate knowledge of 68000, Qdos and the P-system can tailor the system to their needs. It is a pity that TDI did not provide an optional environment specific to QL users, with suitably-altered displays and prompts. That would have made the system far more generally attractive to the average QL owner.

## System Software

Each of the language packages is supplied on four Microdrive cartridges. They contain a host of files, though the general user can disregard many of them. In fact, three of the cartridges show only a single file when accessed from Qdos, and the P-system is necessary to view the true contents.

Essentially, each package will contain the P-system Operating System (SYSTEM.PASCAL), the P-code interpreter (SYSTEM.INTERP) and the QL configuration parameters (SYSTEM.MISCINFO). The latter file is explained carefully in the QL Owners' Handbook, supplied with each package, and a utility is provided (CONFIG.CODE) to allow users to configure the system to their specific needs. Figures two and three show the other files supplied with each language, along with a brief description of the use of each. Figure four shows the extra facilities available with the Advanced Development Toolkit package.

The system appears to be aimed mainly at the professional user and such people are likely to be interested in the Advanced Development Toolkit. It is a package supplied on three cartridges and is essential for full use of the system. For instance, the Turtle graphics code files, the Pascal cross-referencer, a native code generator, a 'compress' utility — allowing P-system programs to be run outside the P-system environment — and a debugger are all included in the kit. The files and utilities can be included in the main library (SYSTEM.LIBRARY) using the librarian utility (LIBRARY.CODE), both of which are supplied with the basic system.

The one thing you should not expect to be able to do with the packages is load a Microdrive and write a program. Initially you have to work out which cartridges to use. Having read through the Owners' Handbook, you will know how to copy cartridges and you will have been informed of two different start-up procedures. Which you choose depends on whether you have add-on RAM or not. If not, the PBOOT (or FBOOT for Fortran) goes into mdv1\_, and press F1 or F2, as normal.

Then you wait for something to happen. If you have sufficient memory, a much better method involves using the Pascal — or Fortran cartridge in mdv2\_ — allowing the system to copy the files to RAM, then boot from RAM disc, greatly speeding operations. Fortunately, backing-up cartridges and booting the system are fairly well explained in the book in which you would expect to find them but that is not always the case.





## Reading list

The documentation supplied with the products is comprehensive, verbose and bewildering. In addition to the QL Owners' Handbook, whichever system you buy you will also receive The Operating System Reference Manual, which provides the beginners' introduction to the P-system, the use of the screen editor, and general file management.

Before using the P-system properly, it is also a good idea to check the Program Development Reference Manual, which explains the compilation options and goes into more detail on file management. Advanced Development Toolkit owners will also have to study that booklet which includes sections on the debugger, the native code generator, turtle graphics, and so on.

Finally, depending on which language you have bought, you also receive either the Fortran 77 Reference Manual or the UCSD Pascal Handbook which describe the languages, including any variations and extensions to the standard language implementations.

If you have also bought the Advanced Development Toolkit, your extra manuals consist of the Applications Development Reference Manual, which describes the program development tools — including both editors — the normal on-screen editor, and EDVANCE for large files — available either in the basic system, or as part of the Advanced Toolkit. Other toolkit files, such as the REMTALK utility, which allows machine-to-machine file transfer via serial ports, are also discussed. In addition, the manual explains the use of the language extensions for inter-lingual communication, allowing Fortran, Pascal, Basic and assembler units to interface with one another.

The more serious user will also need the Assembler Reference Manual and the Internal Architecture Reference Manual which describe the P-system, P-code and the P-machine in detail. They are again supplied with the toolkit.

## The languages

The SofTech Microsystems Fortran 77 is very similar to the ANSI standard Fortran 77 subset. A number of additions from the full standard have been included, for one reason or another. The only two features not supported are that procedures cannot be passed as parameters, and that INTEGER and REAL data types use different amounts of storage. It is unlikely that you will ever find a situation where passing a procedure parameter is essential, especially on small systems. The Fortran system supplied defaults to four-word reals, but alternative compilation files allow for

two-word reals.

There are a number of P-system extensions to both the Pascal and Fortran implementations. For instance, a number of compiler directives may be used to allow, say, different language units to communicate with each other. Another extra to standard UCSD Pascal and Fortran are turtle graphic commands, configured for use on the QL in either four- to eight-colour modes. They should be compatible with other P-system turtle graphic implementations but some terminals will not have the available colours, and one or two implementations are known not to be able to display text and graphics simultaneously.

Although the language products will run on a basic 128K QL, TDI recommends either add-on memory and/or disc drives for a more acceptable performance. The P-system requires 64K of RAM for storage, 12K for the P-code interpreter and 5K for the interface to the Qdos operating system. TDI suggests that a QL with 256K add-on memory is a practical minimum configuration.

With that set-up, the system would operate mainly from RAM disc. Alternatively, disc storage of at least 400K is suggested, though that is likely to be more costly. A word of warning to anybody reading TDI advertisements concerning the speed of its system. It is measured on a QL with extra RAM and TDI states in the Owners' Handbook that it has "observed that RAM cards with 'zero wait states' cause the QL to run approximately 80 percent faster than when using only the 128K internal memory."

In conclusion, it must be said that the TDI programs are definitely designed for the professional user. If you are looking for a new language, predominantly for use on the QL, you would be best-advised to choose one of the excellent Metacomco packages. Metacomco has taken far greater pains to ensure that its packages are best configured for the QL user. On the other hand, TDI has tried to maintain the P-system user interface found on other micros. It is ideal for anybody using the system on other machines but makes the software much less friendly for the casual wear.

## TDI SOFTWARE

TDI Software Ltd, 29 Alma Vale Road, Bristol BS8 2HL.  
0272 742796.

UCSD Pascal	£99.95
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# TDI LANGUAGES



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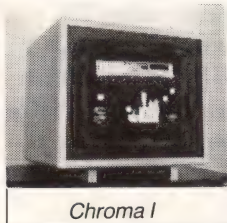
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James Lucy shows the way to professional screen presentation using SuperBasic windows and some imaginative programming tricks.

# A VIEW

Windows are one of the features which set the QL apart from lesser machines. For the QL programmer the versatility of the screen output is a great advantage in producing high-quality, easy-to-use programs. One of the most useful features, and one which forms a major part of both SuperBasic and Qdos, is the ability to display simultaneously a number of different screen windows. We look at harnessing that power, highlighting some of the lesser-known display facilities and present a short program, the Window Editor, which can be used to create the attractive and professional-looking multi-window displays used on many commercial programs.

## Opening windows

A window is an area of the 512x256 pixel screen set aside for output from a particular channel. When the QL is switched on the initial windows attached to SuperBasic channels 0,1,2 are set up according to information in the ROM and are, of course, different for monitor and TV mode. Some 'foreign language' QLs will have further window differences in TV mode.

The window associated with a channel may be changed by the SuperBasic command WINDOW; the point to note is that the position of a window is defined relative to the screen origin — the top left-hand corner of the TV tube in effect — but subsequent commands using pixel co-ordinates such as BLOCK operate relative to the window origin. In fact, once a screen channel has been created, it is not possible to establish the dimensions and position of the window without peeking the channel tables or executing a little machine code.

Windows, of course, may overlap either partially or totally, in which case clearing one window will destroy anything in the overlapping part of the other. Some of the SuperBasic extension programs now available, such as Giga-Basic, make possible non-destructive overlapping windows of the type used for the pull-down menus on the Macintosh but, if large areas of screen are being saved to RAM, the amount of memory required can become a problem.

## Enhancing effects

SuperBasic offers a number of facilities not provided by lesser Basics and it is relatively easy to overlook them if you have learned programming on another machine. The commands PAN, SCROLL and CLS, for instance, do not necessarily operate on the whole window. The following codes are used to denote areas of the display:

- 0 — Whole window area (default value).
- 1 — Area above, but not including, cursor line.
- 2 — Area below, but not including, cursor line.
- 3 — Whole cursor line.
- 4 — From the cursor to end of cursor line.

CLS can use any of those codes, PAN can take areas 0,3,4 and SCROLL areas 0,1 and 2. Imaginative use of the facilities can create some interesting effects. Suppose you wish to reverse the normal order of displaying successive printed lines — that is, you would like the first printed message to appear in line 6, say, of your window and the next message to replace it on that line, the first line scrolling down to make room for it. That means the user always knows where to look for the next message and creates an effect similar to that used on some advertising signs. The following procedure does the trick for messages less than one line long, assuming mode 8 and normal character size:

```
100 DEFine PROCedure prt(string$)
110 AT 4,0: SCROLL 10,2
120 AT 5,0: PRINT string$
130 END DEFine prt
```

You can try it out by typing in this line, too:

```
FOR a=65 to 90: prt FILL$(CHR$(a),
20):pause 10
```

Note the use of FILL\$, another neglected function.

Sinclair/QL World May 1986





# TO A QL

Further interesting effects can be created by using two overlapping windows, perhaps with different paper colours, scrolling, panning and clearing part or all of either window. The full power of the QL screen driver begins to be apparent when you consider that it can be done for a large number of different windows almost simultaneously.

## Quick on the draw

BLOCK is another under-used facility, perhaps because most drawing uses the graphics co-ordinate system and BLOCK uses pixels. The machine code invoked by BLOCK, however, offers a much faster route to the screen than does that for LINE, so it can be used as a very fast way of drawing horizontal or vertical lines.

Another advantage is that the lines can be of any width. The accompanying

Window Editor program uses BLOCK for the 'window' frames; LINE was too slow to be practical and would present co-ordinate system conversion difficulties.

A little-known use of BLOCK is as an alternative to the versatile but slow RECOLOUR command. By selecting OVER -1 so that the block colour is XORed into the window contents and then drawing a block over all or part of the window, a very fast recolour is achieved. It can be entertaining trying to predict the resulting colours, especially if using INKs outside the range 0 to 7. The following short program provides a convincing demonstration of the speed of BLOCK — try doing the same with RECOLOUR:

```
100 MODE 8: WINDOW 512,256,0,0
110 PAPER 0: CLS
120 x=112: y=66
```

```
130 FOR a=1 TO 7: BLOCK 40,130,
    x+40*(a-1),y,a
140 OVER -1
150 FOR a=0 TO 255: BLOCK 280,
    130,112,66,a: PAUSE 25
```

## Professional presentation

Some readers may have wondered about the windows used in some commercial programs which appear to stand out from the background. That is achieved by displaying a 'shadow' along two sides of the window using, of course, BLOCK. Try this to see the effect:

```
100 MODE 4: WINDOW 512,256,0,0
110 PAPER 4: CLS
120 BLOCK 448,4,36,196,0
130 BLOCK 4,176,480,20,0
140 WINDOW 448,180,32,16
150 PAPER 7: CLS
```

The important point to note is that the BLOCKs are drawn before the window is re-sized and so are immune to subsequent CLS.

## Window editor

The Editor replaces the tedious trial and error method of arranging a number of windows on the screen. The cursor controls move a window 'frame' round the screen; used in conjunction with the SHIFT key, they change the size of the window. Pressing 'f' allows the window to be moved fast; press 's' for slow adjustment. When satisfied with the window size and position, press 'y' for yes and the dimensions necessary for a WINDOW, SCR\_ or CON\_ command will appear in the top left-hand corner. The process can be repeated for as many windows as required.

As well as being useful, the program demonstrates the speed of BLOCK for drawing lines, the power of OVER -1, the convenience of the SELECT ON construct and a rather naughty little POKE for making sure the caps lock is off. The program has been kept as short as possible and contains no on-screen help, to keep typing to the minimum.

```
100 REMark Window Editor
110 REMark James Lucy Tel 0621-891715
120 WINDOW 512,256,0,0 : MODE 4 : OVER -1
130 PAPER 0 : BORDER : CLS
135 inc=2 : s=10 : REMark set ink to red and speed to 10
140 POKE 163976,0 : REMark caps lock off
150 REPEAT new_box
155 REMark Set up standard window:
160 xs=448 : ys=200 : xo=32 : yo=16 : box
170 REPEAT draw_box
180 key = CODE(INKEY$(-1)) : REMark Wait for a key
190 box : REMark Erase old box
200 SELECT ON key
210 =102 : s=10 : REMark f ast, move in steps of 10
220 =115 : s=1 : REMark s low, move in steps of 1
230 =208 : yo=yo-s : IF yo<0 : yo=0 : REMark csr up
240 =216 : yo=yo+s : IF yo>256 : yo=256 : REMark csr down
250 =192 : xo=xo-s : IF xo<0 : xo=0 : REMark csr left
260 =200 : xo=xo+s : IF xo>512 : xo=512 : REMark csr right
265 REMark shift csr down:
270 =220 : yo=yo-s : ys=ys-s : IF ys<2 : yo=yo-s : ys=ys+s
275 REMark shift csr up:
280 =212 : yo=yo+s : ys=ys+s : IF yo>256 : yo=yo+s : ys=ys-s
285 REMark shift csr right:
290 =204 : xo=xo+s : xs=xo+s : IF xs>512 : xo=xo+s : xs=xo-s
295 REMark shift csr left:
300 =196 : xo=xo-s : xs=xo-s : IF xo<0 : xo=xo-s : xs=xo+s
310 =121 : box : REMark 'y' for yes, so draw box
320 CURSOR 0,100,xo,yo : PRINT xs!ys!xo!yo
330 s=10 : inc=inc+2 : IF inc=8 : inc=2
340 NEXT new_box
350 END SELECT
360 box : REMark Draw altered box
370 END REPEAT draw_box
380 :
390 DEFINE PROCEDURE box
400 BLOCK xs,1,xo,yo,inc
410 BLOCK 1,ys-2,xo+xs-1,yo+1,inc
420 BLOCK xs,1,xo,yo+ys-1,inc
430 BLOCK 1,ys-2,xo,yo+1,inc
440 END DEFINE box
```



### QL SOFTWARE



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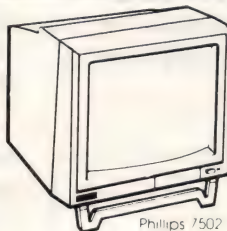
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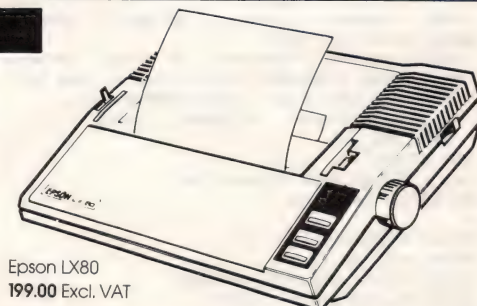
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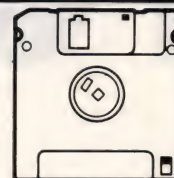


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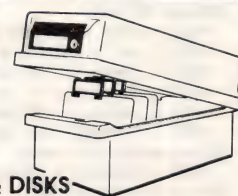


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# SOFTWARE APPLICATIONS



## W. Patrick O'Reilly documents his experience of using Quill to produce technical manuals.

In the last 18 months I have written a number of full length books and technical manuals using Quill and I have learned some tricks which help me to get the best from the system; some of the most useful ones for large document work are outlined.

### Building a workable system

First, if you are to use any word processor for more than an hour or so per day you will have to invest in some good-quality peripherals. Fortunately the QL is better-served than almost any machine in the serious home user field with a range of products which provide professional performance at very reasonable prices.

Most of us find it necessary to develop our computer systems in stages and the QL provides an ideal basis for that. Peripherals can be added as need arises and the

budget permits. It is possible to start, at least, with just a TV and the QL plus its bundled software. Some of my friends who are writers rent a matrix printer for one day per month. At a cost of around £3, that represents excellent value, especially as the printer ribbon is almost worn out by the end of the rental period.

My system, built over the last year or so, consists of: QL, upgraded by Sinclair to Ver\$ = JS; Microvitec Cub 653 colour monitor; Psion suite version 2.0 — replacement for version 1.0; PCML 256K RAM with toolkit commands and RAM disc; Juki 6100 daisywheel printer for camera-ready copy; Epson LX-80 dot matrix printer for rapid drafts — and graphics from Easel.

Of those I would say the monitor is essential, although for word processing alone a green screen monitor would be just as good. The Cub is superb and gives an absolutely rock-steady image.

Many publishers ask specifically for letter-quality typescripts, even though in most cases they will re-set the type rather than use it directly. Some of the near letter quality matrix printers are very good and would certainly be acceptable for that purpose. I have yet to see one, however, which approaches anything near to

the performance of a top-quality daisywheel, which can be used as a means of creating camera-ready copy. In that respect the Juki is a superb printer, although at fewer than 20 characters per second it takes a very long time to print-out a 400-page document. That is why I use a matrix printer for first drafts as, no matter how thoroughly I check from the screen, I find there are always a few typing errors which are found only when checking hard copy. The most common error is caused by the tendency of the QL to produce double letters if, like me, you hit keys off-centre occasionally and create an input from an adjacent key.

The published printer drivers for the Juki provide most of the facilities I need, but not all. I do not know why the printer reviews seem to be incorrect but if you want on occasion to use such facilities as subscripted and superscripted characters and to retain correct line-spacing, table one contains data which really works.

Installation is easy. Simply run the INSTALL\_BAS program and call up the Diablo printer data. Then make the few changes indicated in the table. Install the printer as Juki, in case you want to use the Diablo



driver at a later date. I have assumed you are using the serial interface at 300 baud and are printing to single sheet rather than continuous forms stationery.

From my Quill copy cartridge I strip off all but the essential information. That means that my working Microdrive only holds the — modified, see later — BOOT program, the Quill code and the data file PRINTER.DAT set to suit the printer I am using. Equally, when formatting a RAM disc to hold that software I need only 110 sectors, not the 200 which would be necessary if I kept the help file and installation program in memory. I am assuming, of course, that you will dispense with the help file only when you are confident that you can put Quill through its paces unaided.

All this means more working space for your large documents. Also, of course, a few useful utilities, such as plotter drivers and the like, or a spare copy of Easel and its re-named boot program can be crammed on to your Quill copy Microdrive in the interests of economy.

The extra RAM — it need not necessarily be a RAM disc system — is of tremendous benefit and I would strongly recommend such an upgrade to anyone using the QL, with or without floppy discs. It is not that the Microdrives are particularly unreliable — I have found them similar in failure rate to floppy disc systems — namely unacceptable, that is, if your document is to be lost in the event of a drive error. It is very rare, however, that I create documents smaller than the 800 to 1,200-word limit which the basic QL/Quill system can handle without using edit files, and the machine is unusable for far too long during Microdrive operations.

With 256K of extra RAM I could write a 20,000-word chapter without using Microdrives. I do not, however, for one very good reason — if there were a mains failure I would lose everything and no doubt also my mind. What the extra RAM means is that I can save regularly to Microdrive, confident that if the save is unsuccessful — bad or changed medium. I will get the "same document?" prompt from Quill and, on

pressing ENTER, my working copy is still there. All I need to do is to re-try the save with a new cartridge.

Incidentally, the diagnostic "file I/O incomplete" will be displayed if you try to save a file to a medium — mdv or RAM Disc — which has insufficient space for the document. Do not panic; provided you are not using the medium for an edit file you can change the Microdrive cartridge, or call up another RAM disc, and then save to that.

When I buy Microdrives — I prefer the "book-shaped" boxes of four — I format each one six times before use. Any which fail to format up to within one or two sectors of their maximum capacity — i.e., if the format command eventually receives a response such as 109/115 — are likely to fail early in their working life so I do not accept them. It could be that the oxide coating is thin over a small region or that the tape has become stretched locally. Either way, Qdos will mark those sectors and subsequently avoid using them. The trouble is that immediately adjacent sectors may be





marginal; a little wear due to friction and they, too, might fail, with serious if not disastrous results.

There are cartridge "doctor" programs available for the QL and no doubt the "bad or changed medium" report is less worrying if you have one of them and can drive it. Here are two tricks which may help you recover some of your lost Quill files provided the directory of your cartridge is not corrupted:

If a file fails to load into Quill from mdv2\_, try loading the same file from mdv1\_. On more than one occasion I have recovered a file that way. Remember to save to a fresh cartridge, of course.

Load Quill and set up a page format with margins as you require them. Then use the merge command F3, 0 (for 'Other commands'), M (for 'Merge'), and then the drive reference and your lost file name followed by ENTER.

Quill will merge your file into the blank format up to the point where the data corruption occurs. You will get the diagnostic 'merge failed' but with luck you should then have in RAM a sizeable portion — sometimes all — of your lost file.

Not quite so useful, admittedly, but generally you can also print the leading good portion of a 'file I/O incomplete' corrupted file rather than lose it altogether. Hard copy may be better than nothing.

## A way of working

For each document I create I keep two current copies on Microdrive as a matter of course. It is tiresome but experience has taught me that peace of mind is worth a great deal.

Back-up copies are best made by using the SAVE command if at all possible. The trouble with the BACK-UP command and the operating system COPY mdv2\_... to mdv1\_... is that in many cases the system does not mind if you ask it to copy a corrupted file; it will do so satisfactorily. When you find your master copy has failed to load with the diagnostic report 'not a QUILL file' or 'file I/O incomplete' you will be upset to discover you have an identical file on your back-up cartridge and it gets an identical report from Quill.

That is where RAM discs are particularly handy, since once you have set up your system in the morning you can keep two cartridges in mdv1 and mdv2 and save periodically to them both in turn. When a cartridge is full I always re-format it and write out any worn sectors — admittedly a rare occurrence if you insist on cartridges which format fully in the first instance — before doing a final save on to the cartridge.

I have modified the boot program for RAM disc operation. Quill is put into ram1\_ and any text files into ram2\_, using the wild-card copy facility in the toolkit, before the 'ram's are used as 'mdv's. The program 'q' is used to start Quill from RAM disc.

There is no confusion about which is the latest version of any of my document files, because they are all dated. That information is stored on the directory of the drive — including the RAM discs — and can be interrogated using the toolkit extension command:

wstat mdv2\_ or wstat ram2\_

Not only is the size (in sectors) of each file displayed,

but also the date and time of its last copy to that medium.

## File size

Even with a disc system it is unlikely that you will be able to store a complete book as a single file, and it would be a rather silly thing to do in any case. Generally I find a chapter of twenty or thirty A4 pages (single-spaced) is a sensible maximum size. As supplied, QUILL 2.0 will not handle documents as large as this, but Psion have provided a 'patch' to allow QL Quill documents of more than 15 pages.

**SETTING UP THE JUKI 6100  
PRINTER DRIVER**

The main DIP switches on the JUKI  
should be set as follows (cut sheet  
paper assumed):

1	Automatic line feed	OFF
2	Printing impression level (high = ON)	OFF
3	Host computer (ON = IBM PC)	ON
4	)	OFF
5	) ITALIAN character set	ON
6	)	ON
7	Paper type (ON = cut sheet)	ON
8	Form length (ON = 12 inches)	ON
9	Line spacing (OFF = 1/6, ON = 1/8 inch)	OFF
10	UNUSED	OFF

Using PSION's program INSTALL\_BAS  
edit the DIABLO printer driver to read:

DRIVER NAME	:JUKI	
PORT	:ser1	
BAUD RATE	:300	
PARITY	:even	
LINES/PAGE	:172 (for 12 inch paper)	
CHAR/LINE	:80	
CONTINUOUS FORMS	:no	
END OF LINE	:CR,LF	
PREAMBLE CODE	:CR,ESC,HT,NUL,ESC,9	
	(sets carriage "home" to LHS)	
POSTamble CODE	:none	
BOLD ON	:ESC,W	
BOLD OFF	:ESC,X	
UNDERLINE ON	:ESC,E	
UNDERLINE OFF	:ESC,R	
SUBSCRIPT ON	:ESC,RS,ACK,U,ESC,RS,BS	
SUBSCRIPT OFF	:ESC,RS,ACK,D,ESC,RS,BS	
SUPERScript ON	:ESC,RS,ACK,U,ESC,RS,BS	
SUPERScript OFF	:ESC,RS,ACK,D,ESC,RS,BS	
TRANSLATE 1	:C,*	

To modify your Quill Version 2.0 load the boot program and list it. For RAM Disc operation the 'scr's in line 9 have been changed to 'con's (which won't in any way affect operation directly from microdrives). Now type in the additional lines of program listed in Table 4 and run it with your Quill copy in mdv1. N.B. Make sure your cartridge is not write protected; the plastic protection nib on the side of the cartridge should not have been removed. (If it is missing you can easily override the protection using a piece of Selotape.)

(N.B. If you wish to save this as your Boot program, lines 10 and higher should be deleted after you have run it for the first time, as these contain instructions for permanently modifying the Quill code and only need executing once.)

## Hang-ups

Unless your mains supply is really steady and free from transients you may find that your QL freezes-up occasionally. The processor is not damaged in any way — it just becomes very introverted, ignoring any attempts you might make from the keyboard to stimulate it into visible activity. If you are using Quill at the time the cursor will freeze or disappear and anything created since your last SAVE will be lost irretrievably.

If that has never happened to you and you would

like to know what it feels like, try holding down the keys CONTROL and ALT and pressing 7. simultaneously. The re-set your QL; as I was saying, it is not pleasant.

Mains filters are available from a number of suppliers and with your QL supplied via one of them crashes will be far less likely. No computer system is 100 percent perfect, however, and there are a few things which you can do to increase dramatically the chances of a crash when using Quill version 2.0. I list some of the situations which on occasion in the last 18 months have caused me repeated problems:

Scrolling backwards through a document, which one often wants to do when editing. No doubt for some very good reasons, Quill takes a little longer to scan backwards through a file than it does in the forward direction, and on several occasions the cursor has wandered out of control before disappearing. I am still caught by that occasionally but the pain can be minimised by making a SAVE to Microdrive before scrolling backwards.

If the top line of a document is written in bold face I can sometimes crash the system if I use the line delete keys — CONTROL and CURSOR DOWN — to take out the heading. That is avoided easily; insert the new heading before deleting the old one.

Merging a large file into the beginning of another file can be fatal. That can be overcome by saving the current file, loading the merge file, and using GOTO to set the cursor at the bottom of that file; then merge the former current file.

Since those problems occur sometimes but not always, they are very difficult to track. Psion has not been able to solve them and so I have learned to live with them. Overall, I believe Quill on the QL is a superb word processing system. I like the on-screen formatting very much and the absence of embedded commands for typeface changes.

## A wish list

There are a few extras which I would hope Psion will be able to provide in a Version 3 — perhaps for next Christmas? The most useful to me would certainly include:

A facility to print-out documents as a background task while continuing to use the word processor. Unlike most low-cost microcomputers, the QL is multi-tasking, so that must be possible and, indeed, a spooling command is included with the PCML RAM extension I use, so I can do that when working in Basic.

A facility to mark a block of text and write it to a file — or, even better, to merge a marked block of text from one file into another.

The ability to select from at least two printer drivers without having to return to Basic and run the install program.

A facility for writing different headers to odd- and even-numbered pages.

Details of a patch which would load Quill with its prompts window off instead of on would be a useful time-saver.

During 1985 my QL, Quill and I have clocked more than 1,000 A4 pages of single-spaced text. I think the system works.



# LISP

## THE LANGUAGE

Our LISP tutorial continues with a guide to using functions to manipulate last month's data lists.

**T**he basic principles behind the language LISP and how data lists are stored were dealt with last month but those data structures are relatively useless without functions to operate on them.

The three primary functions are CAR, CDR and CONS, which we have already studied, but the majority of LISP implementations will have many more functions built in, as standard. One common function is PLUS, which is equivalent to the Basic '+' operator. A typical PLUS function might look like:

```
(PLUS 1 2 3 (PLUS 4 5))
```

which would return the answer 15 — i.e.,  $1+2+3+4+5$ . It is important to note that PLUS can take any number of arguments. Alternatively, DIFFERENCE, which is the subtract function, must have exactly two arguments, such as

```
(DIFFERENCE 33 22)
```

which will give the answer 11 — i.e.,  $33-22$ . Of course, there is no reason why one of the arguments should not contain a function, so

```
(DIFFERENCE 33 (PLUS 8 14))
```

could also be used.

Other common arithmetic operations are TIMES, taking any number of arguments, and QUOTIENT, which expects two arguments and will perform an integer division. So

```
(TIMES 2 3 -4)
```

will give the answer -24 — i.e.,  $2*3*-4$ , whereas

```
(QUOTIENT 33 5)
```

will give the answer six. That is similar to DIV on the QL,

rather than the '/' (divide) symbol. A related function, which performs the MOD operation, is REMAINDER. Thus

```
(REMAINDER 33 5)
```

returns the answer 3.

That is all very well but it scarcely helps us to write programs. We need to be able to define our own functions. That is done, believe it or not, with a function. The function is called DEFUN, which takes the form:

```
(DEFUN Function_name Parameters Function_body)
```

A typical, though rather contrived, example of that might be:

```
(DEFUN TIMES8 (X) (TIMES 8 X))
```

That very simple function will take its argument, X, and multiply it by eight, using the built-in TIMES function. From then, we can write such things as:

```
(SETQ Y (TIMES8 5))
```

which will assign 40 — i.e.,  $8*5$  — to the variable Y; remember SETQ performs the assignment.

### Conditions and decisions

Now that we have seen how to define a simple function, we look at a very important built-in function, known as COND.

Basic would be an extremely tedious language without the IF...THEN statement. That is the condition which gives programs so much flexibility, by allowing them to make decisions based on previous events. Try to imagine a program without at least one such statement. In Lisp, the operation is performed by the function COND, which has the form:



```
(COND (test#1 action#1)
      (test#2 action#2)
      (test#3 action#3)
      ( . . . )
      ( . . . )
      (test#N action#N))
```

You will notice that this function is split over a number of lines. Don't worry about that, because carriage returns have no significance — it is the brackets which count.

Brackets can become prolific in more complex LISP functions and are often difficult to keep track of. You can alleviate that problem by using a sensible layout, such as that shown. In addition, many implementations offer some form of tracking aid. For instance, when using Metacomco Lisp, the number of angled bracket ('>') prompts on each line correspond to the number of outstanding brackets. The COND function is similar to the Basic statements:

```
IF test#1 THEN
  action#1
ELSE IF test#2 THEN
  action#2
ELSE IF test#3 THEN
  action#3
ELSE . . .
. . . IF test#N THEN
  action#N
ENDIF
```

Thus, COND will work through the tests, in order, until a non-NIL value is encountered. That is considered to be True and the appropriate action is taken. LISP then exits from the COND statement. If none of the tests is true, no action is performed and the COND statement returns the value NIL — i.e., False. Rather than the TRUE and FALSE found in many languages, the two boolean values in LISP are known as T and NIL; F may also be used in the Metacomco version of the language. Consequently, a common form of the COND statement is:

```
(COND (test#1 action#1)
      (test#2 action#2)
      (test#3 action#3)
      ( . . . )
      (test#N action#N)
      (T end_action))
```

Since 'T' will always be true, the end action will be performed if all the other tests fail. That is akin to the ON REMAINDER statement which is part of the SELECT . . . END SELECT condition in SuperBasic.

A simple example will help to show how COND works. A very useful function found in most languages is ABS, which returns the ABSolute value of its single argument. That function is easily added to LISP as:

```
(DEFUN ABS (X)
  (COND ((MINUSP X) (MINUS X))
        (T X)))
```

We have had to use two new built-in functions here. MINUSP requires one argument and will return 'T' (True) if the argument is negative and NIL otherwise. So, if 'X' is negative; then the MINUS function returns the result of COND. As you might expect, MINUS

negates its argument, so it will return the positive equivalent of 'X'. Finally, the second test is always True and returns the value 'X'. If we did not include it, any positive arguments would be returned as NIL, because the COND statement would fail to find a test which is True.

There are a number of test functions, returning boolean values, based on their argument(s). Figure one lists them and their usage.

## Looping the loop

Another very common construct, invaluable in Basic, is the loop. It is usually formed by the FOR . . . ENDFOR loop but a much more versatile loop format, available in SuperBasic, is the REPEAT . . . UNTIL, or REPEAT . . . WHILE. Using SuperBasic, the UNTIL is performed by a normal condition within the REPEAT . . . ENDREPEAT section, which will EXIT the loop. LISP has a similar loop construct, of the form:

```
(LOOP action1 action2 . . .)
```

One of those actions usually will be either the UNTIL or the WHILE function, which will allow the loop to terminate. We can look at the operation of the loop through a simple example. We will try to define a function which will add a list of numbers and return the total as the result. Working from the function definition, we would get something like:

```
(DEFUN ADDUP (1st (tot))
  function_body)
```

Here, we are calling the function 'ADDUP' and it takes one parameter which we will identify as '1st'. The 'tot' parameter is optional because it is placed inside a further set of brackets. In that case, 'tot' will be a local — to the function — variable, which we will use to hold the total sum at each stage. Consequently, the first statement of our program should zero that total. Our function will now look like:

```
(DEFUN ADDUP (1st (tot))
  (SETQ tot 0)
  function_body)
```

The next stage is to add a loop which will add all the numbers. To do that, we will do the following at each stage:

a, add the first item in the list to 'tot'; b, ignore the first item in the list from now on; c, stop when there are no more items left in the list.

Looking at the last first, it can be written as an UNTIL function, which will terminate the LOOP when the list is equivalent to the empty list. Looking at the conditional functions in figure one, we find that NULL will perform that activity, so the terminating condition will look like:

```
(UNTIL (NULL 1st) tot)
```

Putting the 'tot' at the end will ensure that that value is returned when the loop terminates. Then (a) will be a statement of the form:

```
(SETQ tot (PLUS tot (CAR tot)))
```

and (b) will be:

```
(SETQ 1st (CDR 1st))
```

We can then write our entire function, which will look like:



FIGURE 1.

(AND arg1 arg2 . . .)	(EQ arg1 arg2)	(LESSP arg1 arg2)	Both of these functions will return T if their argument is NIL, and NIL otherwise.
AND can take any number of arguments, and will return T (in this case the last argument) only if all the arguments are non-NIL, otherwise NIL is returned. AND evaluates its arguments in order, terminating with a NIL value, or the end of the list, so it will not necessarily evaluate all of its arguments.	This will return the value T if 'arg1' and 'arg2' are the same. This is the case if they are the same identifier, equal numbers or identical lists. In the latter case, the list identifiers must literally point to the same list in memory, not merely different lists with the same contents.	Returns T if 'arg1' is less than 'arg2'.	(NUMBERP arg) This function will return T if its argument is a number.
(ATOM arg)	(EQUAL arg1 arg2)	(LISTP arg)	(ONEP arg) Returns T if its argument is the number one. In other words (EQ arg 1).
Will return T if its argument is an atom. This is an identifier, number, or machine code entry-point.	This is similar to EQ, but is often more useful when the arguments are lists. EQUAL will compare all the elements of its arguments, so two lists with the same structure and values will give the result T.	This function will return the value T if its argument is a list, or dotted pair. This is the exact opposite of the conditional function ATOM.	(OR arg1 arg2 . . .) The logical-OR function will evaluate its arguments in order, returning T (the first non-NIL argument) if at least one argument is non-NIL, otherwise NIL is returned.
(CHARP arg)	(GREATERP arg1 arg2)	(MEMBER arg1 arg2)	(ZEROP arg) Similar to ONEP, this will return T if its argument is zero. In other words (EQ arg 0).
Will return T if its argument is an identifier.	Returns T if 'arg1' is greater than 'arg2'.	This function will search 'arg2' for an occurrence of 'arg1', returning the remainder of 'arg2', starting with the first occurrence of 'arg1'. If 'arg1' does not occur within 'arg2', then the function returns NIL.	
(DIGIT arg)		(MINUSP arg)	
Will return T if its argument is a single character digit.		Returns T if its argument is a negative number.	
		(NOT arg) or (NULL arg)	

```
(DEFUN ADDUP (1st (tot))
  (SETQ tot 0)
  (LOOP (UNTIL (NULL 1st) tot)
    (SETQ tot (PLUS tot (CAR 1st)))
    (SETQ 1st (CDR 1st)))
  ))
```

We could then call this function, just as any other in LISP. For example:

```
(ADDUP '(1 3 -5 7 2))
```

would return the answer eight.

## Recursion

Though found in many LISP implementations, LOOP is not a standard LISP construct. In most cases, recursion is more versatile and requires less code for loop operations. To see how it works, let us code the foregoing function in a recursive manner. The final definition would be along the lines of:

```
(DEFUN ADDUP (1st)
  (COND ((NULL 1st) 0)
        (T (PLUS (CAR 1st)
                  (ADDUP (CDR 1st)))))
  ))
```

That is obviously a far more elegant solution to the problem. Effectively, if the COND finds that the end of the list has been reached it returns the answer zero. Otherwise the T always gives true, so the first item of the list (CAR 1st) is added to all the remaining items. To find the sum of the remaining items, the function ADDUP, which we have just defined, is called.

If you find recursion confusing, try imagining what is happening in terms of the structure diagrams developed last month. In general, it is usually not a good idea to think too carefully about how recursion works. Just regard it on a superficial level and assume that everything will do what you want it to do.

As a final example of the power of recursive functions, let us try to write the EQUAL function, as described in figure one. That function must be able to handle large lists, if necessary, checking all the values and the structure of each list to ensure they are the same.

Let us assume that the two arguments are known as

'arg1' and 'arg2'. There are a number of conditions for which we need to check. First, if (EQ arg1 arg2) is true, then an EQUAL function should immediately return true, because either the two arguments are the same identifier, same number or identical lists in memory. The code for this will be:

```
((EQ arg1 arg2) T)
```

If that test fails, and yet one of the two arguments is an ATOM, the test obviously has failed and EQUAL should return NIL. That is again easily checked for with the function:

```
((OR (ATOM arg1) (ATOM arg2)) NIL)
```

We need not worry about both arguments being atoms. If that were the case, and they were the same the EQ function would have been true. Otherwise we want to return NIL, so everything is satisfactory.

Now for the tricky portion. We know that both the arguments are lists, and we know that the lists are not identical in memory, but we have no idea what the list structure looks like. One thing we know is that, because both arguments are lists, they must have a CAR and CDR argument, even if the CDR argument is NIL.

So all we really need to do is to find independently whether the CAR and CDR elements of each list are equal (EQUAL). Using the power of recursion, we can call the EQUAL function which we have not even finished writing. The final version of this function looks something like:

```
(DEFUN EQUAL (arg1 arg2)
  (COND ((EQ arg1 arg2) T)
        ((OR (ATOM arg1) (ATOM arg2)) NIL)
        ((EQUAL (CAR arg1) (CAR arg2))
         (EQUAL (CDR arg1) (CDR arg2)))
        (T NIL))
  ))
```

By now, you should be able to appreciate the subtlety and power of LISP. Next month, we will develop a complete worked example of how LISP can solve a more complex problem and introduce a few more important functions.



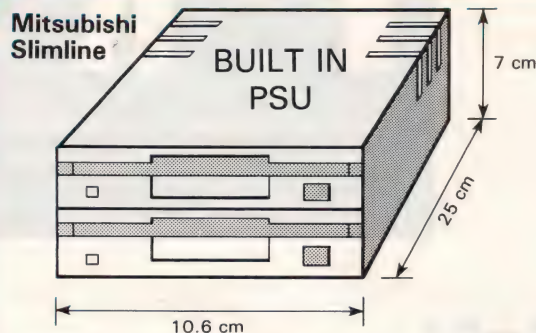
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## FCOPY — Pt 2 Rob Sherratt

As promised in the March issue, here is the second section of Rob Sherratt's fast copy utility for the QL. The final part will appear in the June issue. The machine code is in the form of a well commented source file so you should have few problems in discovering how

it works.

If you do not have an assembler, or simply cannot wait until next month, you can obtain a copy of the program from the Microdrive Exchange. See page 59 for details.

```
*
*   TTL   SPOOL : FAST DATA TRANSFER PROGRAM
*
*   SPOOL : FAST DATA TRANSFER PROGRAM
*   -----
*
*   * Author   : Rob Sherratt
*   * Date    : 19th Sept 1984
*   * Version : 1.0
*
*   * Description :
*   * -----
*
*   * Copies from #channel_a to #channel_b until either EOF on #channel_a is
*   * detected or the current job is killed. The code is re-entrant and a new
*   * SPL_JOB can be started before a previous one has finished. There is no
*   * limit to the number of SPL_JOB tasks that can run at any one time (except
*   * for the amount of QL memory spare).
*
*   * There are 2 new commands added to SUPERBASIC : SPOOL and SPOOL_N. SPOOL is
*   * used for file to file duplication operations, whereas SPOOL_N transfers
*   * data only, and does not copy file headers. Also 1 new function is added,
*   * called NUM_JOBS which returns the number of machine code jobs presently
*   * owned by Superbasic. A returned value of 0 indicates that any jobs started
*   * off by Superbasic have now completed.
*
*   * Load / Installation Instructions :
*   * -----
*
*   * Allocate some resident procedure space, load the procedure and then call
*   * the procedure start address (to link it into SUPERBASIC). Note that this
*   * must only ever be done when no machine code jobs are being "execed".
*
*   * 10  a = RESPR (512)          (note that this can only be done ...
*   * 20  LBYTES mdv1_spool_code,a  ... when the QL is first powered up)
*   * 30  CALL a                   (causes spool_code to install itself)
*
*   *
*   * Example Showing a Fast File Transfer From Superbasic :
*   * -----
*
*   * 10  count = NUM_JOBS          (fetch number of machine code jobs)
*   * 20  OPEN_IN #4,"mdv1_filea"    (for console or ser1 etc)
*   * 30  OPEN_NEW #5,"mdv2_fileb"   (or screen or ser2 etc)
*   * 40  SPOOL #4 TO #5              (copy data in background)
*
*   *
*   * ... have to wait until SPOOL jobs have finished before closing files ..
*
*   * 50  REPEAT wait_loop
```

```
* 60  IF NUM_JOBS = count THEN EXIT wait_loop
* 70  END REPEAT wait_loop
*
* ... the I/O channels can now be safely closed ...
*
* 80  CLOSE #4                      (must ensure that SPOOL has finished ..
* 90  CLOSE #5                      ... operating first)
*
* ... the example above will do the equivalent of the COPY command ...
*
* 10  COPY mdv1_filea TO mdv2_fileb
*
* ... except that control will be returned to SUPERBASIC during the SPOOL
* operation, whereas the COPY command hogs all the execution time, and BASIC
* is held up until the copy has completed. Also SPOOL allows us to open a
* number of files for reading on one drive, then open files for writing on
* another drive, then copy the data - results in efficient microdrive file
* transfers, and the potential for rapid cartridge duplication (see the
* SUPERBASIC program called BACKUP_BAS written by Rob Sherratt).
*
*
* EQUATES AND OTHER DEFINITIONS
* -----
*
* Program specific equate values
*
* job_id EQU 0                      Force SPL_JOB to be independent
* code_sp EQU 16                    Code space for SPL_JOB identification
* data_sp EQU 126                   Buffer and stack space for SPL_JOB
* buffer_sp EQU 64                  File buffer space for SPL_JOB
* priority EQU $1F                  Job priority just less than BASIC
* ss EQU $2000                     Supervisor status bit
*
* QDOS error numbers
*
* err_ef EQU -10                    End of file
* err_bp EQU -15                    Bad Parameter
*
* Job Header and Save Area Offsets
*
* jb_d2 EQU $28                     Save area for register D2
* jb_a0 EQU $40                     Save area for register A0
* jb_a1 EQU $44                     Save area for register A1
* jb_a2 EQU $48                     Save area for register A2
* jb_a6 EQU $58                     Save area for register A6
*
* Equates for use with the QDOS macro
*
* trap1 EQU 1                       Trap 1 parameter
* trap2 EQU 2                       Trap 2 parameter
* trap3 EQU 3                       Trap 3 parameter
* trap4 EQU 4                       Trap 4 parameter
* vcall EQU 5                       Vector call parameter
*
* QDOS trap #1 D0 keys - Manager Trap
*
* mt_cjob EQU $01                   Create a new job
* mt_jinf EQU $02                   Get information on a job
* mt_frjob EQU $05                   Force remove a job
* mt_activ EQU $0A                   Activate a created job
* mt_prior EQU $0B                   Changes job priority
*
* QDOS trap #2 D0 keys - IO Subsystem
*
* io_open EQU 1                     Open channel
* io_close EQU 2                     Close channel
*
* QDOS trap #2 D3 keys - IO Subsystem
*
```



```

io_share EQU 1          Open old (shared) file
io_new EQU 2            Open new (exclusive) file
*
* QDOS trap #3 D0 keys - IO Subsystem
*
io_fstrg EQU 3          Fetch a string of bytes
io_sstrg EQU 7          Send a string of bytes
*
* QDOS trap #3 D0 keys - File Handling Subsystem
*
fs_flush EQU $41        Flush output file's buffers
fs_heads EQU $46        Write 14 bytes of the file header
fs_headr EQU $47        Read 14 bytes of a file header
*
* QDOS vectors for interface to SUPERBASIC
*
ut_err0 EQU $0CA        Send an error message to channel 0
bp_init EQU $110        Superbasic procedure initialisation
ca_gtfp EQU $114        Superbasic get float. point vector call
*
* Offset and other values used for SUPERBASIC interfacing
*
bv_chbas EQU $30        Offset to Superbasic channel number ptr
bv_rip EQU $58          Offset to Superbasic arith. stack ptr.
ch_lench EQU $28        Length of each channel number entry
hash EQU $80            Masks out hash bit from name entries
*
* Arithmetic vectors and value specifiers for floating point / integer
*
bv_chrix EQU $11A       Reserve arithmetic stack space
ri_exec EQU $11C        Execute an arithmetic operation
ri_int EQU $04          Truncate top of stack to integer
ri_float EQU $08        Convert integer to floating point
*
* QDOS MACRO FOR OPERATING SYSTEM TRAPS AND CALLS
*
* -----
*
QDOS MACRO
NOLIST

    IFEQ \1-1
    LIST
    MOVEQ #\2,D0
    TRAP #1          Manager Trap
    NOLIST
    ENDC

    IFEQ \1-2
    LIST
    MOVEQ #\2,D0
    TRAP #2          IO Subsystem trap
    NOLIST
    ENDC

    IFEQ \1-3
    LIST
    MOVEQ #\2,D0
    TRAP #3          IO Data transfer trap
    NOLIST
    ENDC

    IFEQ \1-4
    LIST
    TRAP #4          Use register A6 as base address
    NOLIST
    ENDC

    IFEQ \1-5
    LIST
    MOVE.W \2,A2
    JSR (A2)         Get vector address
                     Call the QDOS subroutine specified
    NOLIST
    ENDC

    LIST
    ENDM

*
*
* INSTALL SPOOL, SPOOL_N and NUM_JOBS AS EXTRA COMMANDS FROM SUPERBASIC
*
* -----

```

```

* This first section of code should be executed once and once only after
* the whole code section has been loaded into resident procedure RAM space.
* The QDOS call to bp_init causes the procedure parameter block whose address
* is passed in A1 to be linked into the Superbasic Name Table.
*
START LEA PROCS,A1      Procedure definition address
      QDOS vcall,bp_init Initialise the new name table entry
      RTS              ... and return to Superbasic
*
* Now follow the name table entries for the SPOOL and NUM_JOBS commands. The
* format for this table is given on page 6 of QDOS manual section headed
* "Interfacing to QL Superbasic"
*
PROCS DC 2              Two procedures only
      DC SPOOL-*        Relative start address
      DC.B 5,'SPOOL'    SPOOL procedure name (ASCII)
      DC SPOOL_N-*      Relative start address
      DC.B 7,'SPOOL_N'  SPOOL_N procedure name (ASCII)
      DC 0              No more procedures to come
*
      DC 1              One function to be defined
      DC NUM_JOBS-*     Relative start address
      DC.B 8,'NUM_JOBS',0 NUM_JOBS function name (ASCII)
      DC 0              End of definition table
*
* SPOOL / SPOOL_N : GET CHANNEL NUMBERS AND SPAWN A SPL_JOB
*
* -----
*
* Note that the new SPL_JOB that is spawned has no code space apart from its
* job identification text. This is because the code that is actually run is
* in the resident procedure RAM area of the QL, and because the code is
* re-entrant we can appear to be using several copies of it at the same time.
* It is only the data space used by each copy that must be allocated each
* time during the QDOS at_cjob trap.
*
* On entry to SPOOL, the SUPERBASIC command processor sets up the following
* registers for us (note that A1, A3 and A5 are all relative to A6) :
*
* A1 : Points to the base of the arithmetic stack
* A3 : Points to first parameter in the name table (each 8 bytes long)
* A5 : Points past the last parameter in the name table
* A6 : Points to the base of all SUPERBASIC work area (don't use !)
* A7 : SUPERBASIC stack pointer (don't use !)
*
* On exit, SUPERBASIC expects D0.L to contain an error code (or 0).
*
* Firstly, push a word onto the stack that will be used to tell SPL_JOB
* whether or not file headers are to be copied.
*
SPOOL MOVE.L #0,-(A7)      Push flag onto stack for use later
      BRA.S DQ_SPOOL
SPOOL_N MOVE.L #1,-(A7)    Push flag onto stack for use later
*
* Get (hopefully) the #device_a floating point parameter and store it on the
* arithmetic stack indexed by (A6,A1.L). Note the following :
*
* Two f.p. parameters should have been supplied, and so A3 will point to
* the first and A5 will point past the second. Each entry is 8 bytes long, so
* by subtracting 8 from A5 we force ca_gtfp to fetch the first floating point
* parameter only.
*
DQ_SPOOL SUBQ.L #8,A5      Assume there are 2 parameters only
      CLR.L D1            Ensure high word of D1 is zero
      MOVE 0(A6,A3.L),D1  Fetch the code word for parameter 1
      AND #hash,D1        Mask out the hash bit ...
      BEQ ERR_BP1         ... error if hash is not supplied
      QDOS vcall,ca_gtfp  Get floating point #channel_a number
      BNE ERROR1          Handle any error in ca_gtfp
      CMP #1,D3            Was 1 floating point parameter found ? ...
      BNE ERR_BP1         ... if not, perform error handling
*
* We have a floating point number (for #channel_a) stored on the arithmetic
* stack at the moment. Convert it to integer and adjust the arith. stack ptr.
*
      MOVE #RI_INT,D0     Specify f.p. to integer operation
      QDOS vcall,ri_exec  Execute arithmetic operation
      MOVE 0(A6,A1.L),D1  Get integer from top of arith. stack
      ADDQ #2,A1          Adjust the stack pointer for use later
*
* A bit of tricky maths follows here. We have to fetch the actual QDOS
* channel number from the address formed by the following formula :

```



```

*
*  addr = #ch_no * bytes_per_entry + base_addr_offset + SUPERBASIC_var_base
*  = D1.W * #ch_lench + bv_chbas(A6) + A6.L
*  = D1.L + A2.L + A6.L
*
*      MULU    #ch_lench,D1      Multiply ch_no by bytes_per_entry
*      ADDA.L  D1,A2             Add channel number offset
*      MOVE.L  0(A6,A2.L),-(A7)  Get channel_a no. and save on stack
*
*  Now get the second parameter #channel_b passed to us from SUPERBASIC.
*  At the moment A3 points to the start of the first parameter and A5
*  points to the start of the second parameter.
*
*      MOVE.L  A5,A3             Set A3 to the start of parameter 2
*      ADDQ.L  #0,A5             Set A5 to the end of parameter 2
*      CLR.L   D1                Ensure high word of D1 is zero
*      MOVE    0(A6,A3.L),D1     Fetch the code word for parameter 1
*      AND     #hash,D1          Mask out the hash bit ...
*      BEQ     ERR_BP2           ... error if hash is not supplied
*      QDOS    vcall,ca_gtfp     Get superbasic channel number #b
*      BNE     ERROR2            Handle any error in ca_gtfp
*      CMP     #1,D3             Was 1 floating point parameter found? ..
*      BNE     ERR_BP2           ... if not, perform error handling
*
*  We have a floating point number for #channel_b on the arithmetic stack.
*  Convert the number to integer and adjust the arithmetic stack pointer.
*
*      MOVE     #RI_INT,D0        Specify f.p. to integer operation
*      QDOS     vcall,ri_exec     Execute arithmetic operation
*      MOVE     0(A6,A1.L),D1     Get integer from top of arith. stack
*      ADDQ     #2,A1             Adjust the stack pointer for use later
*
*  The same tricky maths again. Fetch the actual QDOS channel number. The
*  address calculation formula has been given already.
*
*      MULU     #ch_lench,D1      Multiply ch_no by bytes_per_entry
*      MOVE.L   bv_chbas(A6),A2   Base_addr_offset of channel table
*      ADDA.L   D1,A2             Add channel number offset
*      MOVE.L   0(A6,A2.L),-(A7)  Get channel_b no. and save on stack
*
*  Create a new SPL_JOB entry to transfer the data for us. On exit from
*  mt_cjob D1.L contains the new job's id not the old one. Also, A0.L is left
*  pointing to the job's start address, not the base of the job area.
*
*      MOVEQ    #job_id,D1        Independent new job created
*      MOVEQ    #code_sp,D2       Set code space for SPL_JOB program
*      MOVEQ    #data_sp,D3       Set data space for SPL_JOB program
*
*  Note that the start address for the new job is NOT the start of code space
*  that will be allocated for that job.
*
*      LEA.L    SPL_JOB,A1        Set start address for SPL_JOB program
*      QDOS     trap1,mt_cjob      Create SPL_JOB entry
*      TST.L    D0                Did any errors occur? ...
*      BNE     ERROR3             ... if so process the error
*
*  Perform a "dummy" call to mt_prior, not to set the job's priority, but to
*  obtain the base address of the job's control area into A0.L
*
*      MOVEQ    #0,D2             Ensure the job is not activated yet
*      QDOS     trap1,mt_prior     Fetch base of job control area into A0
*      TST.L    D0                Did any errors occur? ...
*      BNE     ERROR3             ... if so, perform error handling
*
*  Set the SPL_JOB's initial registers as follows:
*
*      A0.L : Channel_id for device_a (ie read from this one)
*      A2.L : Channel_id for device_b (ie write to this one)
*      D2.L : Set to 1 for SPOOL_N and set to 0 for SPOOL
*
*      MOVE.L   -(A7)+,jb_a0(A0)  Preset Job's A0 register to channel_a
*      MOVE.L   (A7)+,jb_d2(A0)  Preset Job's file header copy flag
*
*  Register A6 in the job control area (ie jb_a6(A0)) will have been set
*  to point to the start of the reserved job area. Although there is no code
*  in the "dummy code space" to be executed, we store the job's name in
*  standard QDOS format to allow the job to be identified using the JOBS
*  command.
*
*      MOVE.L   jb_a6(A0),A0      Point to Job's allocated code area
*      MOVEQ    #14,D2            Number of bytes -1 to be loaded
*      LEA      ID_BLOCK,A2       Point to Job_id block

```

```

LOAD    MOVE.B  (A2)+,(A0)+      Load a byte
        DBF     D2,LOAD          Exit loop only if D2 = -1
        BRA.S   ACTIVATE         Skip around the Job_id data
*
*  ID_BLOCK DC.W    0,0,0          Don't care about bytes 0 to 5
        DC.W    $4AFB           Bytes 6 and 7 are QDOS flag word
        DC.W    5                Number of characters in job name
        DC.B    'Spool',0       ASCII Job name + alignment byte
*
*  Now that everything has been set up ready, activate the SPL_JOB and let
*  it handle the actual data transfer.
*
*  ACTIVATE MOVEQ   #priority,D2   Set job priority a bit less than BASIC
        MOVEQ   #0,D3            Run the new job before we've finished
        QDOS    trap1,mt_activ    Activate the new SPL_JOB
        TST.L   D0               Did any errors occur? ...
        BNE     ERROR0           ... if so report errors.
        RTS                      Normal exit to SUPERBASIC
*
*  ERROR PROCESSING FOR THE SPOOL OR SPOOL_N COMMAND
*
*  Error has occurred in fetching the first channel number. Force the error
*  message "bad parameter" to be displayed
*
*  ERR_BP1 MOVEQ   #err_bp,D0      Set "bad parameter" error code
        BRA.S   ERROR1           Pop 1 unwanted long word off the stack
*
*  Error has occurred in fetching the second channel number. Force the error
*  message "bad parameter" to be displayed
*
*  ERR_BP2 MOVEQ   #err_bp,D0      Set "bad parameter" error code
        BRA.S   ERROR2           Pop 2 unwanted long words off the stack
*
*  Error has occurred with three long words on the stack to be tidied up
*
*  ERROR3 MOVE.L   (A7)+,A0        Scrap stack entry number 3
*
*  Error has occurred with two long words on the stack to be tidied up
*
*  ERROR2 MOVE.L   (A7)+,A0        Scrap stack entry number 2
*
*  Error has occurred with one long word on the stack at present
*
*  ERROR1 MOVE.L   (A7)+,A0        Scrap stack entry number 1
*
*  Error has occurred and there is nothing on the stack that needs tidying up.
*
*  ERROR0 NOP
*
*  KILL_JOB kills off the job entry just created, because an error has occurred
*  before the job could be run. The job id (if any) is in D1.L, error message
*  in D0.L. If mt_frjob fails (ie job does not exist) ignore the error
*  condition generated, because it's possible we hadn't installed it anyway.
*
*  KILL_JOB MOVE.L  D0,-(A7)       Save error code on the stack
        MOVEQ   #0,D3            Generate no error message
        QDOS    trap1,mt_frjob    Kill the job whose id is in D1.L
        MOVE.L  (A7)+,D0          Get the original error message back
        RTS                      Exit with error message to Superbasic

```

## Indenter Colin Hunniford

Our challenge to readers to produce a shortest though was this one from file listing utility of less than 100 lines Colin Hunniford which does the job in prompted a number of responses. The a remarkable 18 lines.







```

1190 =2:PRINT CHR$(189)
1200 =3:PRINT CHR$(191)
1210 =4:PRINT CHR$(188)
1220 END SELECT
1230 views=views+1
1240 FOR n=1 TO 200
1250 time:IF INKEY$=""THEN NEXT n
1260 END DEFine
1270 :
1280 DEFine PROCedure quit
1290 CLS
1300 views=0:view
1310 PRINT#0\\ "You quit."
1320 STOP
1330 END DEFine
1340 :
1350 DEFine PROCedure left
1360 d=d-1:IF d=0 THEN d=4
1370 END DEFine
1380 :
1390 DEFine PROCedure right
1400 d=d+1:IF d=5 THEN d=1
1410 END DEFine
1420 :
1430 DEFine PROCedure forward
1440 IF in$=0 THEN RETURN
1450 x1=0:y1=0
1460 SElect ON d
1470 =1:x1=-1
1480 =2:y1=1
1490 =3:x1=1
1500 =4:y1=-1
1510 END SElect
1520 FOR n=1 TO in$
1530 IF a$(x+x1,y+y1)<>" "THEN
1540 PRINT#0;"Ouch! That's a wall !":PAUSE 100:R
ETurn
1550 ELSE
1560 x=x+x1:y=y+y1
1570 END IF
1580 NEXT n
1590 END DEFine
1600 :
1610 DEFine PROCedure print_
1620 CLS:x1=0:y1=0
1630 SElect ON d
1640 =1:x1=-1
1650 =2:y1=1
1660 =3:x1=1
1670 =4:y1=-1
1680 END SElect
1690 FOR n=0 TO 5
1700 floor n:time
1710 IF a$(x+n*x1-y1,y+n*y1+x1)=" "THEN left_ n
1720 IF a$(x+n*x1+y1,y+n*y1-x1)=" "THEN right_ n
1730 IF y+y1*n<3 THEN exit_ n+1:RETURN
1740 IF a$(x+n*x1+x1,y+n*y1+y1)<>" "THEN wall_ n
:RETURN
1750 NEXT n
1760 END DEFine
1770 :
1780 DEFine PROCedure floor(di)
1790 FILL 0:INK 0
1800 SElect ON di
1810 =0:
1820 LINE 450,0 TO 450,300,50,0 TO 50,300:FILL 1
1830 LINE 50,0 TO 90,30,450,0 TO 410,30,450,300
TO 410,270,50,300 TO 90,270
1840 =1:
1850 LINE 410,30 TO 410,270,90,30 TO 90,270:FILL
1
1860 LINE 90,30 TO 140,67,410,30 TO 360,67,410,2
70 TO 360,233,90,270 TO 140,233
1870 =2:
1880 LINE 360,67 TO 360,233,140,67 TO 140,233:FI
LL 1
1890 LINE 140,67 TO 175,95,360,67 TO 325,95,360,
233 TO 325,205,140,233 TO 175,205
1900 =3:
1910 LINE 325,95 TO 325,205,175,95 TO 175,205:FI
LL 1
1920 LINE 175,95 TO 205,115,325,95 TO 295,115,32
5,205 TO 295,185,175,205 TO 205,185

```

```

1930 =4:
1940 LINE 295,115 TO 295,185,205,115 TO 205,185:
FILL 1
1950 LINE 205,115 TO 230,135,295,115 TO 270,135,
295,185 TO 270,165,205,185 TO 230,165
1960 =5:
1970 LINE 230,135 TO 230,165,270,135 TO 270,165:
FILL 1
1980 LINE 230,135 TO 270,165,270,135 TO 230,165
1990 END SElect
2000 END DEFine
2010 :
2020 DEFine PROCedure left_(di)
2030 SElect ON di
2040 =0:LINE 50,0 TO 50,300
2050 =1:LINE 90,30 TO 90,270
2060 =2:LINE 140,60 TO 140,233
2070 =3:LINE 175,95 TO 175,205
2080 =4:LINE 205,115 TO 205,185
2090 END SElect
2100 END DEFine
2110 :
2120 DEFine PROCedure right_(di)
2130 SElect ON di
2140 =0:LINE 450,0 TO 450,30,450,270 TO 450,300
2150 =1:LINE 410,30 TO 410,66,410,233 TO 410,270
2160 =2:LINE 360,66 TO 360,95,360,205 TO 360,233
2170 =3:LINE 325,95 TO 325,115,325,185 TO 325,20
5
2180 =4:LINE 295,115 TO 295,135,295,165 TO 295,1
85
2190 END SElect
2200 END DEFine
2210 :
2220 DEFine PROCedure wall_(di)
2230 FILL 1:INK 4
2240 SElect ON di
2250 =0:LINE 90,30 TO 90,270,410,30 TO 410,270
2260 =1:LINE 140,66 TO 140,233,360,66 TO 360,233
2270 =2:LINE 175,95 TO 175,205,325,95 TO 325,205
2280 =3:LINE 205,115 TO 205,185,295,115 TO 295,1
85
2290 =4:LINE 230,135 TO 230,165,270,135 TO 270,1
65
2300 END SElect
2310 END DEFine
2320 :
2330 DEFine PROCedure exit_(di)
2340 wall_ di-1
2350 FILL 1:INK 6
2360 SElect ON di
2370 =1:LINE 175,30 TO 175,205,325,30 TO 325,205
:out=1
2380 =2:LINE 205,66 TO 205,185,295,66 TO 295,185
2390 =3:LINE 230,95 TO 230,165,270,95 TO 270,165
2400 =4:LINE 240,115 TO 240,155,260,115 TO 260,1
55
2410 END SElect
2420 INK 0
2430 END DEFine

```

## Compacter Jason Creak

In marked contrast to the numerous THEN, LET statements, and unneces-  
space indenter programs featured sary spaces. While it will not improve  
recently, this one actually compresses the readability of your programs,  
SuperBasic files. It works by con- memory savings of up to 30 percent  
catenating lines and removing REM, are possible.

```

1 REMark SuperBASIC Compactor
2 REMark vsn 2.76
3 REMark 1985 J.N.Creak
100 set_up
110 REpeat loop:process
120 DEFine PROCedure set_up:LOCa1 a
130 WINDOW#0,452,42,30,208

```



```

140 WINDOW#1,228,202,256,6
150 WINDOW#2,228,202,28,6
160 MODE 4:FOR a=0 TO 2:PAPER#a,0:INK#a,7:BORDER
#a,1,2:CSIZE#a,1,0:CLS#a
170 END Define
180 Define PROCedure process:LOCAL s$,o$
190 INPUT#2,"Which source file ?"\s$\
200 INPUT "Which object file ?"\o$\
210 IF VER$="JS"
220 WHEN ERROR :REPORT:BEEP 0,5,10,5,7:PRINT#0\
"Press any key to stop.":PAUSE:BEEP:err_off:file
s:STOP
230 END IF
240 OPEN_IN#3,s$:OPEN_NEW#4,o$
250 comp_prog
260 CLOSE#3:CLOSE#4
270 PRINT#2:PRINT:BEEP 20000,40
280 IF VER$="JS":err_off
290 END Define
300 Define PROCedure err_off
310 WHEN ERROR :REPORT:STOP
320 END Define
330 Define FuNction letter(a$):LOCAL a
340 a=CODE(a$):SELECT ON a=48 TO 57:RETURN -1:=9
5,97 TO 122:RETURN 1:=65 TO 90:RETURN 2:=REMAIND
ER :RETURN 0
350 END Define
360 Define FuNction pro_line$(line$):LOCAL char_
loop,pos%,c$,sp_req%,c,find_end,p2%
370 control%=0:line$=line$(1 TO y%-1)&line$(y%+1
TO)&' ':pos%=y%-1
380 REPEAT char_loop
390 pos%=pos%+1:IF pos%=LEN(line$):EXIT char_loo
P
400 c$=line$(pos%)
410 IF letter(c$)
420 p2%=pos%
430 REPEAT find_end
440 p2%=p2%+1:IF p2%>LEN(line$):EXIT find_end
450 IF letter(line$(p2%))=0:EXIT find_end
460 END REPEAT find_end
470 c$=line$(pos% TO p2%-1)
480 sp_req%=1
490 c=letter(line$(pos%))
500 SElect ON c=2:capital:=1:lower:=-1:pos%=p2%-
1
510 ELSE
520 c=CODE(c$)
530 SElect ON c
540 =34:pos%=""INSTR line$(pos%+1 TO)+pos%
550 =39:pos%=""INSTR line$(pos%+1 TO)+pos%
560 =32:c$=line$(pos%+1)
570 IF c$=' ':line$=line$(1 TO pos%-1)&line$(pos
%+1 TO):pos%=pos%-1:NEXT char_loop
580 IF (sp_req%=3 AND c$ INSTR " ")=0 OR sp_req%
=2 AND(c$="" OR c$=" ") OR sp_req% AND letter(c
$)=0:line$=line$(1 TO pos%-1)&line$(pos%+1 TO):
pos%=pos%-1
590 =58:IF line$(pos%+1)=" " OR pos%=y% OR pos%=
LEN(line$)-1:line$=line$(1 TO pos%-1)&line$(pos%
+1 TO):pos%=pos%-1
600 END SElect
610 ns
620 END IF
630 END REPEAT char_loop
640 IF y%=LEN(line$):RETURN ' '
650 IF concat$<>' ':line$=""&line$(y% TO)
660 RETURN line$(1 TO LEN(line$)-1)
670 END Define
680 Define PROCedure capital:LOCAL a
690 a=in_str(c$,"/REMark/LET/THEN/GO/LIST/")
700 SElect ON a
710 =1:line$=line$(1 TO pos%-1-(line$(pos%-1)="
"))&" ":pos%=LEN(line$)-1:RETURN
720 =8:line$=line$(1 TO pos%-1)&line$(pos%+4 TO)
:pos%=pos%-1:ns:RETURN
730 =12:line$=line$(1 TO pos%-1)&" "&line$(p2% T
O):pos%=pos%-2:ns:RETURN
740 =17,20:PRINT#0\c$;" not valid."\""/2
750 END SElect
760 IF in_str(c$,'/SElect/IF/WHEN/REPEAT/FOR/'):
control%=1
770 a=in_str(c$,space_req$)

```

```

780 IF a:sp_req%=2+(space_req$(a-1)='a')
790 a=in_str(c$,"/DEFINE/LOCAL/SElect/ERROR/REPE
at/END/RETURN/")
800 IF a
810 SElect ON a
820 =1:IF line$(p2%+1)=" ":line$=line$(1 TO pos%
)&"EFPROC"&line$(p2%+10 TO):ELSE :line$=line$(1
TO pos%)&"EFFN"&line$(p2%+9 TO)
830 =34:line$=line$(1 TO pos%+2)&line$(p2%+1 TO
p2%+3-(line$(p2%+1)="I")+(line$(p2%+1)="W"))&lin
e$(' 'INSTR line$(p2%+1 TO)+p2% TO)
840 =REMAINDER :line$=line$(1 TO pos%+2)&line$(p
os%+LEN(c$) TO)
850 END SElect
860 pos%=pos%+' 'INSTR line$(pos% TO)-2
870 ELSE
880 pos%=p2%-1
890 END IF
900 END Define
910 Define PROCedure lower:LOCAL a$,q$
920 IF LEN(c$)>3:IF in_str(c$(1 TO 4),"con_/scr
_/mdv1/mdv2/ser1/ser2/net1/neto/flp1/flp2/par_")
:pos%=pos%+LEN(c$)-1:RETURN
930 a$=in_str(c$,name$)
940 IF a$=0:a$=LEN(name$)+5:name$=name$&next_no$
&'/'&c$&'/'
950 q$=c_nom$(a$):line$=line$(1 TO pos%-1)&q$&li
ne$(p2% TO):pos%=pos%+LEN(q$)-1
960 END Define
970 Define FuNction next_no$:LOCAL a$
980 IF n_no%>9999:PRINT#0\ "Too many identifiers
.",1/0
990 a$=n_no%:n_no%=n_no%+1:RETURN FILL$( '0',4-LE
N(a$))&a$
1000 END Define
1010 Define FuNction c_nom$(a$)
1020 a$=name$(a%-4 TO a%-1)
1030 IF a%<26:RETURN r_char$(a%)
1040 a%=a%-26:IF a%<936:RETURN r_char$(a% MOD 26
)&r_char$(a% DIV 26)
1050 a%=a%-936:RETURN r_char$(a% MOD 936 MOD 26)
&r_char$(a% MOD 936 DIV 26)&r_char$(a% DIV 936)
1060 END Define
1070 Define FuNction r_char$(a%)
1080 RETURN CHR$(97+a%-75*(a%>25))
1090 END Define
1100 Define PROCedure ns
1110 sp_req%=0
1120 END Define
1130 Define PROCedure comp_prog:LOCAL name$,n_no
$,dump%,control%,concat$,each_line,nxt$,y$,space
_req$
1140 space_req$="/q/ARC/q/ARC_R/q/CIRCLE/q/CIRCL
E_R/a/DATA/a/RESTORE/q/ELLIPSE/a/GOSUB/a/GOTO/a/
IF/q/LINE/q/LINE_R/q/POINT/q/POINT_R/a/RETURN/q/
SCALE/a/TO/a/STEP/":name$=' ':n_no%=0:concat$=' ':
control%=0
1150 REPEAT each_line
1160 IF EOF(#3)
1170 control%=2
1180 ELSE
1190 INPUT#3,nxt$:PRINT#2,nxt$
1200 y$=' 'INSTR nxt$
1210 IF LEN(nxt$)>13:IF nxt$(y%+1 TO y%+7)="DEFi
ne ":control%=1
1220 IF LEN(nxt$)>y%+5:IF ":DATA "INSTR nxt$ OR
in_str(nxt$(y%+1 TO y%+5)," /WHEN /DATA /"):contr
ol%=1
1230 END IF
1240 IF concat$<>' 'AND control%:PRINT#4,concat$:
PRINT concat$:concat$=' '
1250 IF control%=2:EXIT each_line
1260 concat$=concat$&pro_line$(nxt$)
1270 END REPEAT each_line
1280 END Define
1290 Define PROCedure files
1300 CLOSE#3:CLOSE#4
1310 IF in_str(o$(1 TO 3)," /mdv/flp/"):DELETE o$
1320 PRINT#0,"Files cleared."
1330 END Define
1340 Define FuNction in_str(a$,b$)
1350 RETURN '/'&a$&'/' INSTR b$
1360 END Define

```



# SOFTWARE FILE

Our man with the joystick, Marcus Jeffery, puts the latest QL games to the test.



## QL Quboids

Remember *Monsters* for the BBC/Electron? You know the Dig-Dig-Dig, Fill-Fill-Fill one. No? Well, anyway, that is what *QL Quboids* is. There are a number of levels, inter-connected by a series of ladders. In this Sinclair game they are the walkways round the city; the introduction tells you that, because you would not have guessed otherwise. Wandering round are a bunch of monsters, called Nebulons, which you are expected to get rid of.

The monsters do not like heights and if you dig through a walkway with your trusty pneumatic drill it is likely that they will fall in. Having been clumsy enough to fall for that, they show their true dexterity by grabbing the sides to stop their fall and they will pull themselves slowly out of the hole, which miraculously disappears behind them. So you have to dash up and bop them on the head to push them through and kill them.

Unfortunately, if you do not do that they will turn into even nastier monsters, known as Gastroids, which have to be dropped through two holes. That is done by digging holes directly above each other, then dropping the monster through the top one. Even worse, they can turn into Bipods — three holes — or the ultimate nasties,

the Quboids, which can be killed only by a four-hole drop. As you progress through the game, the monsters appear anyway.

There is one other complication. It seems the evil creatures emit an odour and you have to wear special breathing apparatus to survive. You have periodically to replenish it by moving over an air cylinder, otherwise you will turn a funny colour and drop dead. Dashing about in that manner also uses a good deal of energy and running out of energy is also fatal. You can replenish it by collecting food which is scattered about the walkways.

There is no key to allow you to fill a hole, so careful tactics are needed to ensure that you do not become stranded without a ladder, but you can jump through the holes whenever you like. One feature I did not like is that the monster's movements seem to be entirely random. If the monster will home on you, even partially, it gives you a chance to lure it into a deep hole. That means that the nastier monsters seem continually to fall into holes which you have dug in the lower levels as part of a sequence.

So you have to dash up and push them through, then re-dig the hole(s) for another attempt. Before long, you encounter oxygen problems — all part of the game, I suppose. On the whole,

it is a well-produced game.

## QL Jabber

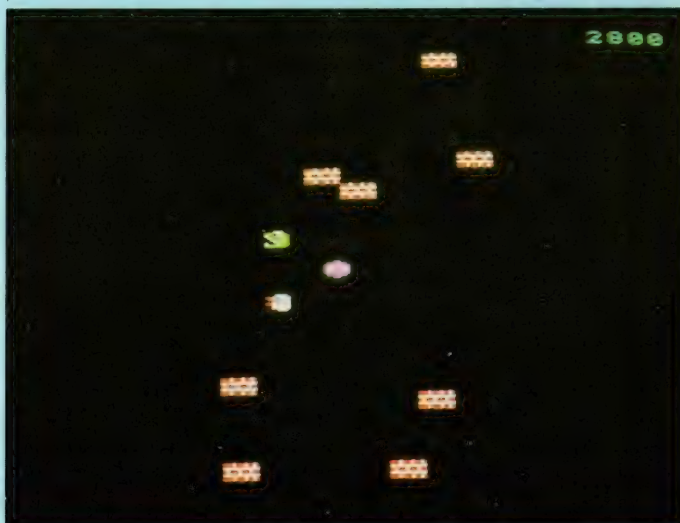
A long-winded, and rather contrived, introduction to this Sinclair game will tell you of the United Solar Space

Try to imagine a two-way caterpillar-type game. You are in the centre and the bad guys, or bad organisms in these days of equality, move horizontally or vertically. Sitting in the centre of the screen, you can move only horizontally and fire vertically. Once hit, the bacteria turn into walls — I don't know why — which will make other bacteria turn when they hit them. Don't worry, you can shoot straight through those walls.

Everything seems fine at first but, two screens later, the E. Coli appear and their circling movements can be disconcerting. All the bacteria have different forms of movement, ranging from horizontal, vertical and diagonal, to circling, fluttering and homing.

Clearing a screen takes you to the next level, where you may not be allowed to shoot through walls, which may no longer be safe. There are 26 levels in all but the programmers think you will have great difficulty even getting close to that figure.

It is by no means a complex game; in

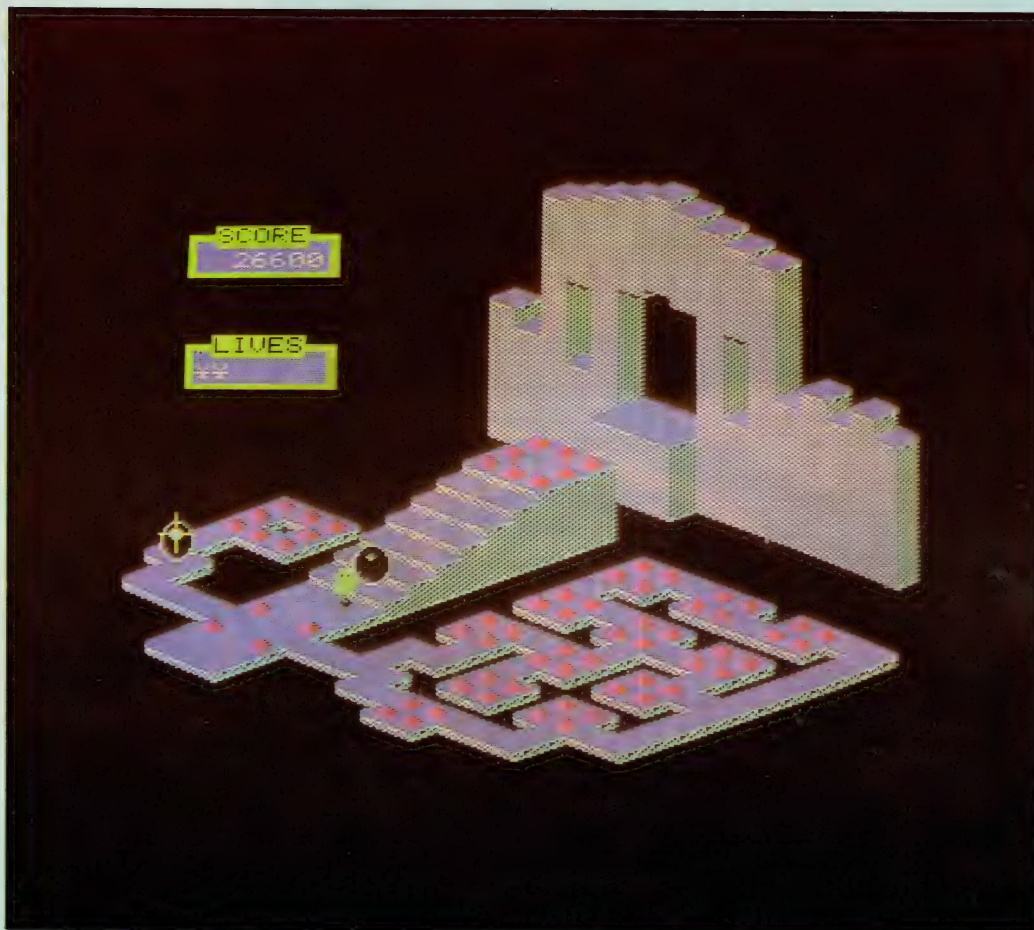


Pilot Training (*Dune*?) and the Disease Control Centre (?). It seems that you are some form of antibiotic and anti-virus drug. Well, you learn something new very day and the names of the nasties certainly confused me. They may sound familiar but I was only just about able to pronounce *Streptococcus* — the weakest of the bunch — and *Staphylococcus* — only a little worse. It seems the deadlist of the bunch is *Rabies*, which is a rapid 'hornet' type.

fact, it is almost too simple. The sprite-type graphics are not incredibly speedy, but serve the purpose, and the game has that professional appearance, including those little touches, such as various clips of music, and the like. Nevertheless, the authors should take full credit for producing an original and additive idea. It is that type of game which leaves you knowing that you could do better, if only A-sterilising we will go.

Sinclair/QL World May 1986





### 3D Slime

Have you ever wanted to be one of those little green men from outer space? Will a little green slime do? If so, read on. *3D Slime*, from Datalink Systems, is a fairly simple game, where you have to flollop — I'm afraid this Hitch Hiker's Guide description, as applied to mattresses, is the best I can find — through Robocity, collecting little purple pyramids. Ours is not to reason why. The important thing is that a number of robotic spheres are not too happy about the situation and will do their best to steamroller you.

The saving grace of the game is the graphics. Each screen is shown in a pseudo-ultimate three-dimensional approach which, though not spectacular, adds interest. In addition, the flolloping of your slime has to be seen to be believed. I never thought I would be sympathetic towards a slime.

Finally, office workers take note. If the boss walks in, a single button pauses the game and places a spreadsheet-looking display on to the screen. Is everybody going mad?

### Wanderer

Perhaps everybody really is going mad. Our next offering gives that truly 3D image — only when wearing the special spectacles — as you embark on an

interplanetary journey, playing poker. Don't stop reading; this is not just a poker game. After a guide explaining how to get the best from your tinted shades, the intro reads:

"It's the year 2987 and somebody is stealing cats. 'Oh, where's my poor pussy?' shrieks your landlady." Well, if

they can print it, so can we. Leaping aboard your solar bicycle, you soon reach your new space vessel and blast-off into the unknown.

At that point, you are faced with a galactic map showing the Sphinx — your ultimate goal — a number of planets and a few black holes. It seems the planets became bored and have

organised an interplanetary poker game, using passing space travellers to communicate; couldn't they think of anything better than that?

It seems that the all-powerful Sphinx has declared that the standard monetary units is — you guessed it — the humble moggy. It appears that the only way to reach the Sphinx is if you are carrying five Aces — including jokers — or 8,000 cats, and the only method of getting them is to persuade the 10 planets to give them to you. You can do that by taking them cards which will improve their hands in exchange. The jokers seem to be powerful cards and you will find them in the black holes.

In addition to the poker business, there is also 3D space combat, where destroying the enemy will allow you to absorb their energy.

The game from Pyramide certainly has plenty to offer, with some form of arcade action through the space flight, strategy in the card-handling, and adventure as you try slowly to reach the Sphinx. Unfortunately, after all the work which has gone into the game, it really is not particularly brilliant. The poker game is not really a true poker game and the space flight, though very clever, allowing you to 3D-fly around objects, is not really very interesting.

It is certainly not up to the 3D-transformation approach on such games as *Elite*. Don't take my word for it but try to see the game yourself. The French programming team obviously knows what it is doing and so it is a pity the game doesn't really work.





"This is certainly another notch up for QL software and an excellent start for Pyramid". Popular Computing Weekly  
29 March - 2nd April, 1986  
Sinclair User Classic ★★★★★ April 1986



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Sinclair/QL World May 1986

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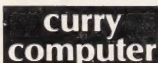
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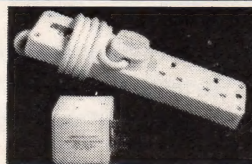
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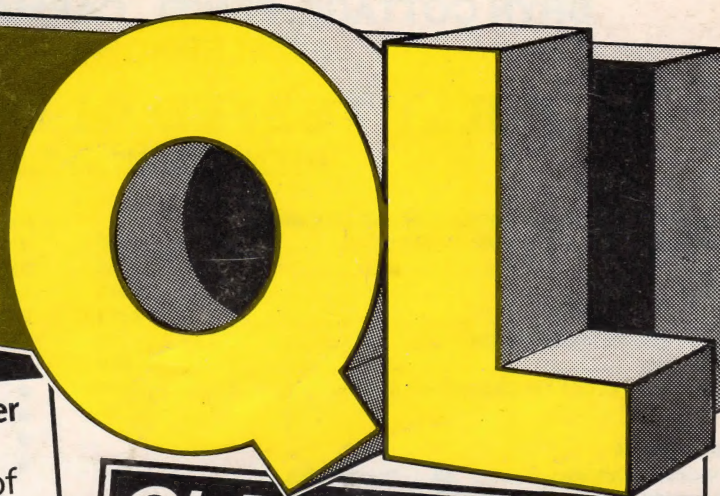
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